

Escola de Pós-Graduação em Economia – EPGE  
Fundação Getúlio Vargas

## **Essays on Credit and Bankruptcy Law**

Tese submetida à Escola de Pós-Graduação em Economia da Fundação  
Getúlio Vargas como requisito para obtenção do título de Doutor em  
Economia.

Aluno: Bruno Funchal  
Professor Orientador: Aloisio Pessoa de Araujo

Rio de Janeiro  
2006

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## Introduction

This thesis is composed of four papers referent to the subject of Credit and Bankruptcy Law. In each essay – that corresponds to one chapter – we aim at analyzing the influence of default on credit market, considering different legal situations.

In the first chapter we studied the costs of informational failures, as moral hazard, on Brazilian credit market. To measure this effect, we used the recently approved law that regulates payroll loans. The payroll loan is a type of personal credit with repayments directly deducted from the borrowers' payroll check, which, in practice, makes a collateral out of future income. Taking advantage of this experiment our objective was to identify the average effect of the new law on personal credit, using the difference-in-difference procedure, and accounting for general-equilibrium effects. Also, we verified both the direct and indirect effects of the new law (the partial equilibrium effects). Our results indicates that, the new law is associated with an increase of the volume of new personal loans and a reduction in its interest rates, which indicates that the costs generated by information failures is highly significant for the personal credit market. For the institutions directly effected the same results are observed, but stronger. Financial institutions that were not directly affected also suffered, in some way, an impact with the implementation of the new law. In this case, however, we notice a reduction in the volume of the new personal loans, which represents a migration of agents from financial institutions that are not able to offer payroll loans to institutions that are allowed to do that. Also, in the same direction of directly affected financial institutions, a reduction in the interest rate for personal loans was observed. The explanation for this result comes from the fact that the demand for credit decreases for such institutions due to the migration of their clients to institutions benefited with the new law.

The chapter 2 continues our study on individuals, but now we use the U.S. Personal Bankruptcy Law to study the effect of creditors' protection on credit markets development. The conventional wisdom argues that creditor protection through the legal system is associated with a broader credit market in a monotone way, or simply the higher the protection to creditors the better is to the credit market. In this essay we analyze if this finding is still true if the creditors' protection is directly determined by the debtors' punishment. Taking advantage of the heterogeneity between U.S. states provided by a specific issue of the Personal Bankruptcy Law, called bankruptcy exemptions (which determines the creditors' protection), we show that if the creditors' protection is directly determined by the debtors' punishment, the results highlighted by the current literature doesn't hold any more. In fact, there will be a non-monotonic relationship between the creditors' protection (or debtors' punishment) and the size of the credit market, where an intermediate level of protection is optimal for the development of such market.

In the chapters 3 and 4 our focus changes to corporations. The chapter 3 studies the corporate bankruptcy law in Latin America, focusing on the Brazilian reform. We use a simple model to examine the economic incentives associated with several aspects of bankruptcy laws and insolvency procedures, as well as the trade-offs involved, showing how changes in the system could affect a firm's investment, effort, and other choices. Then, we compare bankruptcy procedures across groups of countries, and test empirically the effects of the quality of bankruptcy law. Finally, we studied the recent Brazilian bankruptcy reform, analyzing its main components and possible effects on credit markets.

At last, the chapter 4 also dresses a question about the corporative bankruptcy law. In this essay, our main challenge was to explore the best bankruptcy procedure considering two important cross-country differences: the industry sector characteristic (like the physical capital intensity of each industry sector and its share in the economy) and the costs – direct and indirect – of the bankruptcy procedure. When lawmakers design a bankruptcy law that is best for their specific economy, they cannot just resort to existing theories in economics

and corporate finance because countries differ in their economic environments and usually, these theories do not capture such cross-country differences. Understanding these differences, we can search the best bankruptcy law for particular countries. The theoretical framework was drawn upon the general equilibrium framework with incomplete markets and default. Simulating it for a range of parameters that describe the characteristics of the countries (bankruptcy costs and industry sectors) we proposed the best Corporate Bankruptcy Law for a sample of 44 countries.

## CHAPTER 1

# **Strategic Default and Personal Credit: The Brazilian Natural Experiment<sup>1</sup>**

### **Abstract**

Brazil provided at 2004 an interesting experiment concerning personal credit. The government implemented a new law that allows some financial institutions to offer a specific type of credit. This new law removes a significant share of the moral hazard problem, since the lenders of this type of credit are able to deduct the debt repayment directly from the debtors' payroll check, eliminating the choice of default when debtors are able to pay their loans with their wage. Taking advantage of this fact, we estimate - using the difference-in-difference procedure - the cost of such type of informational failures. Accounting for general-equilibrium effects, we find that the new law produces a decrease in the interest rate charged to personal loans, while the volume of personal credit increases, as expected, improving credit market conditions.

### **1.1. Introduction**

At the end of 2003 the Brazilian Congress approved a new law that regulates payroll loans. The payroll loan is a type of personal credit with repayments directly deducted from the borrowers' payroll check, which, in practice, makes a collateral out of future income.

Before the implementation of the new law, only workers, pensioners and retired workers from the public sector had access to this type of credit. The new law comes to provide such credit to private workers associated to trade unions, pensioners and retired workers from

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<sup>1</sup>This article was made jointly with Christiano Arrigoni Coelho. The authors would like to thank Luis Henrique Braido, Carlos Eugênio da Costa, João Manoel Pinho de Mello, Claudio Ferraz, Rafael Coutinho and the seminar audiences at EPGE/FGV, IPEA and the 2006 Meeting of the Latin American and Caribbean Economic Association at Mexico City for their helpful comments and suggestions.

the National Institution of Social Security (INSS)<sup>2</sup>. Only some financial institutions (those authorized by the government) are able to provide this loan for the INSS beneficiaries.

The new law provides to creditors the capacity to receive their loans' repayment immediately, whenever the debtors have enough income to do it. Thus, such type of loan eliminates a significant part of the strategic default, diminishing the informational failure costs, as moral hazard. The reduction of default's probability increases the expected repayment for the lenders making them willing to offer more credit at better terms.

Taking advantage of this experiment our objective is to identify the average effect of the new law on personal credit, more specifically over the amount of new loans and interest rates, accounting for general-equilibrium effects. Also, we aim at verifying both the direct and indirect effects of the new law (the partial equilibrium effects). In this paper we call direct effect the impact of the new law over the financial institutions that were authorized by the government to offer the payroll loans, and indirect effect the impact over the financial institutions that were not allowed to offer such type of loans.

Despite the theoretical result be straightforward, the general-equilibrium effect is not trivial in this case.<sup>3</sup> The effect over the financial institutions allowed to offer the payroll loans may affect the institutions that were not authorized to offer such credit. For example, we expect a reduction on the interest rates charged by the authorized institutions, but for the not authorized ones it may cause both an increase in the interest rate due to the adverse selection problem or its reduction due to a demand reduction shock. The same problem may happen with the amount of new loans, since we expect an increase of it but it may be just a migration of clients from one group to the other. To solve this problem, we measure the general-equilibrium effect defining the treatment group as the financial institutions that offer the personal credit. Also, we measure the partial equilibrium effect analyzing both groups separately: the authorized institutions and the non-authorized institutions.

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<sup>2</sup>The Brazilian pension system, a pay-as-you-go scheme, is publicly managed by this governmental agency, INSS.

<sup>3</sup>See Heckman et al. (1998)

The econometric method used in this paper is the difference-in-difference procedure. Our analysis uses the fact that only the personal credit<sup>4</sup> was benefited with the new law, making them the treatment group. As control group we use automobile loans since this type of credit has similar features when compared with personal loans<sup>5</sup>, also since the interest rate charged to automobile credit is lower than the one charged to personal credit, it minimizes the potential migration effect that could happen if another type of loan with higher interest rate was used. In the empirical section we address the test of quality of such control, showing that it is a good control. The variation across time and type of credit provides a potential instrument to identify the causal effect of the new law on personal credit market.

The difference-in-difference approach owns several advantages. Our estimator has less bias than a simple mean estimator once we have a control group. For example, in the period before the new law's enforcement the mean of the basic interest rate (taxa selic) was 1.63% per month while in the period after the enforcement this mean rate was 1.36%. If we estimated the new law's effect using the simple difference between the interest rate for the treatment group before and after new law's enforcement we would have a biased estimator, since part of the interest rate decrease in this period is due to the basic interest rate fall. With the difference-in-difference procedure we can have an unbiased estimator without any kind of macroeconomic control. Otherwise, if we estimated the effect using the simple mean we would have to include macroeconomic controls, which increase the number of parameters to be estimated, putting more uncertainty in our estimation and reducing the power of the test. Also, the exogenous nature of the new law is a good opportunity to study how the costs of informational failures affects the personal credit market, without endogeneity problems.

In the end, we find that the new law that regulates payroll loans is actually associated with an increase of the volume of new personal loans and a reduction in its interest rates,

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<sup>4</sup>Personal credit is composed by two modalities of credit: CDC (direct credit to consumer) and payroll loans.

<sup>5</sup>The similarity between both types of credit comes from the collateral. Personal credit owns as collateral the client banking account, i.e, the bank can deduct the loan repayment direct from the client account. Automobile credit, instead, owns as collateral the vehicle that was bought with such loan.

which indicates that the costs generated by information failures is highly significant for the personal credit market. For the institutions directly effected the same results are observed, but stronger. Financial institutions that were not directly affected also suffered, in some way, an impact with the implementation of the new law. In this case, however, we notice a reduction in the volume of the new personal loans, which represents a migration of agents from financial institutions that are not able to offer payroll loans to institutions that are allowed to do that. Also, in the same direction of directly affected financial institutions, a reduction in the interest rate for personal loans was observed. The explanation for this result comes from the fact that the demand for credit decreases for such institutions due to the migration of their clients to institutions benefited with the new law.

On this subject Costa and Mello (2005) estimated the effect of judicial decision on the legality of payroll debit loans in Brazil. In June 2004, a high-level federal court upheld a regional court ruling that had declared payroll deduction illegal. Evidence indicates that it had an adverse impact on banks' risk perception, on interest rates and on the amount lent.

The remainder of the paper is structured as follows: in section 2 we describe the new law and its particularities; in section 3 we describe the database used and the main descriptive statistics; section 4 presents the empirical results; and section 5 concludes.

## **1.2. The New Law**

The specific legislation of payroll loans is not new in the Brazilian financial scenario. The Law 8,112 of December 1990 already validated such type of credit, however applying just to workers, retirees and pensioners of the public sector. For the private sector there was no specific law so far, which brought serious difficulties for the development of this type of credit. Private retirees and pensioners didn't have permission to do such operation and private workers should create a particular instrument between three parts: employee, employer and financial institution. The significant change in this legislation occurred in

September 2003, when the government sent to the House of Representatives the MP<sup>6</sup> 130 that subsequently, in December 2003, turned into Law 10,820. The new law created juridical security of salary consignment through private companies and the National Institution of Social Security (INSS) to private sector formal workers and retired workers respectively. Such type of loans has some boundaries related to the agent income, however. Monthly deductions are limited to thirty percent of agents' disposable wage<sup>7</sup>; the loans should have fix payment during the amortization period; and rescissory earns<sup>8</sup> can be consigned for the amortization of the remainder debt. Employers have several obligations relative to the values and information that are passed to the financial institutions and employees. To make competitive conditions to the employees, the participation of the trade union entities representing the employees is obligatory, but despite the agreement between the trade unions and some financial institution, the employee is free to choose any financial institution that supply this type of credit.

Despite the law be in force since September 2003, just in April 2004<sup>9</sup> it really took effect when the government authorized the Caixa Econômica Federal<sup>10</sup> to offer this type of credit to the pensioners and retired workers from INSS, supported by the new law. Subsequently, BMG (Bank of Minas Gerais) was the first private bank to assign such agreement. Today there are forty four financial institutions authorized by the government to supply this type of credit to pensioners and retired workers from INSS<sup>11</sup>.

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<sup>6</sup>MP is the abbreviation of *Medida Provisória* that is a legislative device in which the executive sends a bill to congress that is effective immediately, pending approval. It has an urgency status that forces the legislator to appreciate its merit. For practical purposes, it is almost equivalent to a full-blown law.

<sup>7</sup>Wage after the compulsory deductions like taxes, pensions, etc.

<sup>8</sup>Rescissory earns comprise all rights of the employee for a contractual break.

<sup>9</sup>To define the exact month that a institution became able to give payroll loans we used the following criteria: when the date of the deal signature was in the first half of the month we considered the same month, otherwise we considered the next month. For example, Caixa Econômica signed the deal in 04/19/2004, so we considered May as the date that it became able.

<sup>10</sup>The Caixa Econômica Federal is the biggest public bank.

<sup>11</sup>For more details about the date of authorization see Appendix.



### 1.3. Description of the data and Descriptive Statistics

The database comes from Central Bank of Brazil according to circular 2.957 of 12/30/1999 and comunicado 7.569 of 05/20/2000.

The database contains daily information about new loans and interest rate. All information is displayed by financial institution, type of loan indexation (prefixed, interest rate indexation, exchange rate indexation and price indexation) and kind of borrower (household or firm).

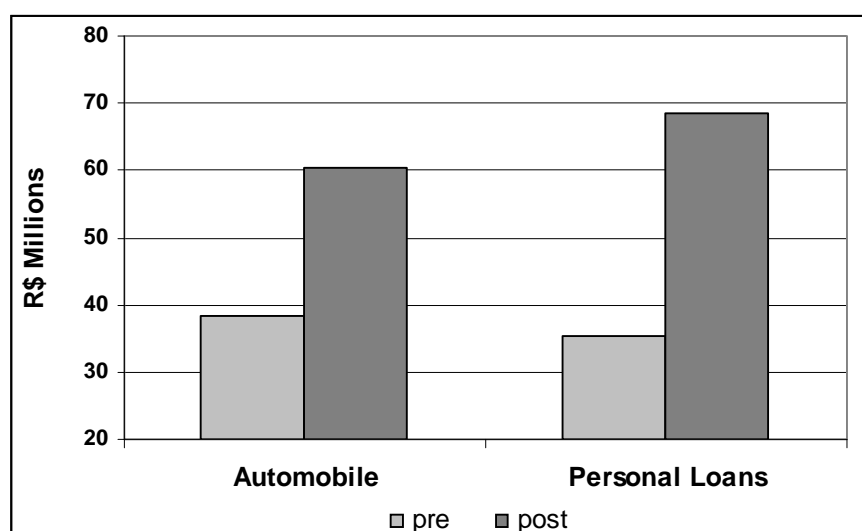
The article uses information about personal loans and automobile loans. Personal loans are credit to households, with considerable screening by financial institutions. The bank's client must have an account with the bank and generally the bank deducts the loans payment from this account, when this has enough funds. Personal loans are composed by two modalities of credit: CDC (direct credit to consumer) and payroll loans. The difference between these two kinds of loans is that in the first one there is no guarantee that the client will not change the bank that he receives his wage while in the payroll loans the client is not allowed to change the bank that he receives his wage once he has signed a loan contract with the bank. These two kinds of loans are not linked with the purchase of a specific good, so the borrower can buy any kind of good or even repay other debts with the loans' proceeds. We use only the prefixed loans, since it is the most usual type of personal credit.

Automobile loans are credit to households that are used to buy automobiles. In this kind of credit the own automobile is the collateral of the transaction. Like in the previous case we use only prefixed loans since they are the most usual in this market.

The sample consists in a group of 112 financial institutions offering personal loans and 57 offering automobile loans. From the 112 institutions of personal loans market there is a sub sample of 40 financial institutions that are able to give payroll loans according to the new law.

We run our empirical tests using monthly data generated through the daily data. The new loans variable is constructed by summing of daily values over the whole month. For the interest rates variable, we use the monthly average, weighting up by respective new loan volume. The sample period is from January 2003 to October 2005, so our sample consists of 34 months and 57 and 112 cross sections units of automobile and personal loans respectively (5,746 observations).

**Figure 1: Mean of new loans before and after the new law**



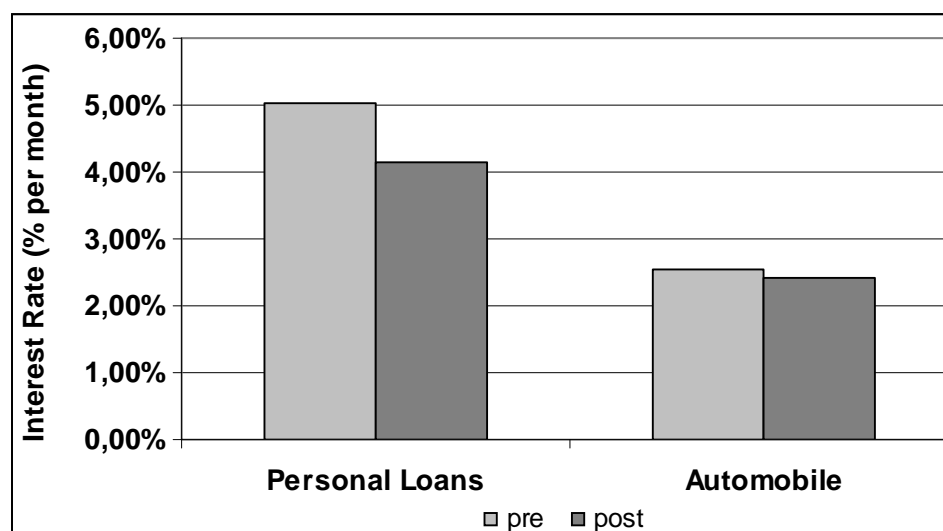
Now we present some descriptive statistics concerning personal and automobile loans before and after the new law of payroll loans take effect. Figure 1 illustrates a strong increase of the new loans volume for personal and automobile loans in the period after the new law take effect. The monthly average of personal credit new loans increased from R\$35.4 millions to R\$68.7 millions, i.e., a rise of R\$33.3 millions which meant a growth rate of 94.2%. The monthly average of automobile new loans increased from R\$38.5 millions to R\$60.5 millions, i.e., a rise of R\$22 millions which meant a growth rate of 57%.

**Table 1: New Loans**

	R\$ Millions		
	pre	post	growth rate
Personal Loans	35,4	68,7	94.2%
Automobile	38,5	60,5	57.0%

The monthly average interest rate (% per month) for personal loans decreased from 5.04% per month before the new law to 4.15% after, i.e., a reduction of 0.89% per month, which annualized means a fall of 11.22% per year. For automobile loans, the monthly average interest rate decreased from 2.55 % to 2.41%, i.e., a reduction of 0.14% per month, which annualized means a fall of 1.69% per year. Thus, the interest rate decline was almost seven times bigger for personal loans in annual terms. Even though there were timing factors that decreased the interest rates for both personal and automobile loans, the reduction for the personal loans was much deeper.

**Figure 2: Mean of interest rate before and after the new law**



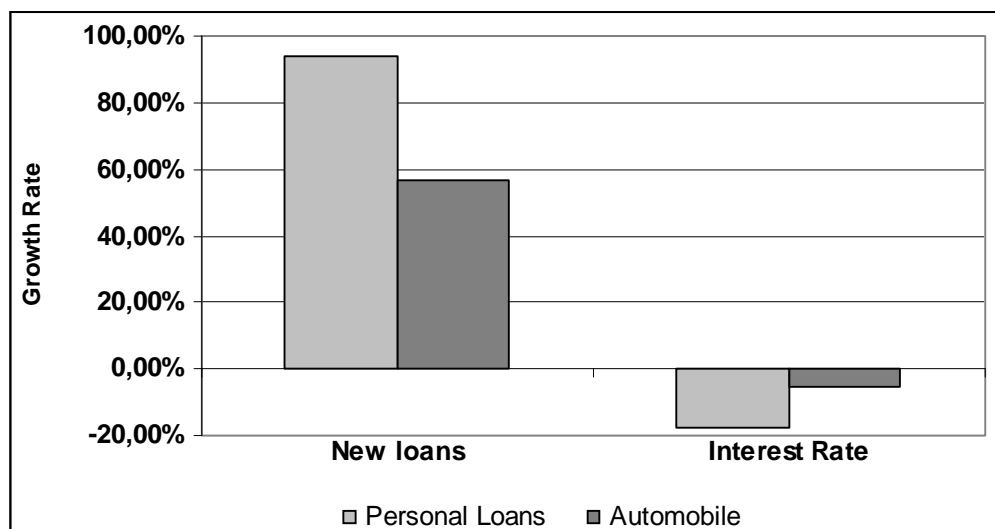
**Table 2: Interest rate**

	% per month		growth rate
	pre	post	
Personal Loans	5,04%	4,15%	-17,69%
Automobile	2,55%	2,41%	-5,59%

Analyzing the above information as growth rate, we notice that the new law affects strongly the personal loans in both considered variables (see Figure 3). The personal new loans suffered a much higher increase than the automobile new loans, 94% against 57%. Also, the reduction of the interest rate was much bigger for personal loans, 17% against 5%.

To sum up, the descriptive statistics show that at the time which new law was implemented, there was a generalized downward trend in the interest rate and upward trend in the new loans volume, but these trends were much stronger for personal loans.

**Figure 3: Growth Rates - personal loans x automobile**



#### 1.4. Empirical Tests

Our objective is to identify the average effect of the new law on personal credit, i.e., the average impact of treatment on the treated. Specifically, we are interested in comparing personal loans when payroll loans are allowed to the counterfactual, that is, personal loans when payroll loans are not allowed for the treatment group at the same point in time. Since the counterfactual is never observed, we must estimate it.

In principle, we would like to randomly assign the type of credit benefitted and non-benefitted with the new law and compare the average outcomes of the two groups. In the absence of a controlled randomized trial, we are forced to turn to nonexperimental methods that mimic it under reasonable conditions. A major concern is that the personal credit could be significantly different from the type of credit that are not affected by the new law and that these differences may be correlated with our dependent variables. In principle, many of the types of (unobservable) characteristics that may confound identification are those that vary

across types of credit but are fixed over time. A common method of controlling for time-invariant unobserved heterogeneity is to use panel data and estimate difference-in-differences models.

Therefore, without the benefit of a controlled randomized trial, we turn to a difference-in-differences approach, which compares the change in outcomes in the treatment group before and after the intervention to the change in outcomes in the control group. By comparing changes, we control for observed and unobserved time-invariant characteristics to the pair type of credit-financial institution that might be correlated with the government authorization as well as with personal loans. The change in the control group is an estimate of the true counterfactual, that is, what would have happened to the treatment group if there had been no intervention. In this paper we use automobile loans since we believe that its fulfill the characteristics of a good control. Another way to state this is that the change in outcomes in treatment group controls for fixed characteristics and the change in outcomes in the control group controls for time-varying factors that are common to both control and treatment groups.

The difference-in-difference model<sup>12</sup> can be specified as a two-way fixed-effect linear regression model:

$$(1.1) \quad y_{it} = c_i + \varphi_t + \beta \cdot dI_i \cdot dT_{it} + \varepsilon_{it}.$$

The right-hand side of the equation include fixed effects to the pair type of credit-financial institution to control for specific factors that are fixed over time, the month fixed effects to control for factors that vary over time but are common across the cross-section, and the coefficient  $\beta$  that is the difference-in-difference estimator of the impact of new law on payroll loans.

We define the diff-in-diff dummy variable as  $dI_i \cdot dT_{it}$ , where:

---

<sup>12</sup>See Meyer (1995).

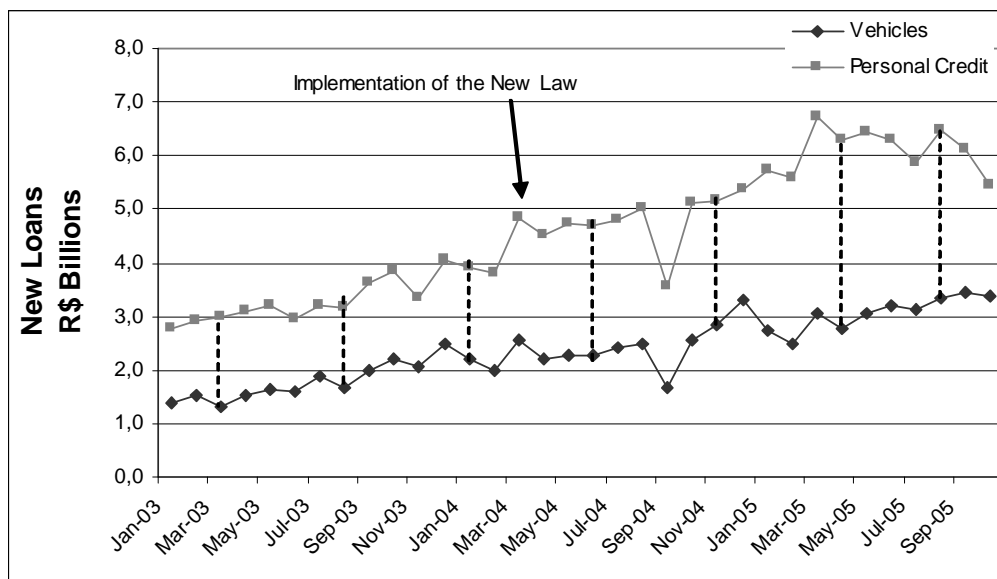
$dI_i$ : is a dummy variable that assumes 1 when the cross section unit  $i$  belongs to the treatment group (the financial institutions that provide personal loans) and 0 otherwise;

$dT_{it}$ : is a dummy variable that assumes 1 if the observed period is after the regulation of the payroll loans concession according to the new law and 0 otherwise. For the institutions that are able to give payroll loans this dummy variable is 1 after the date that the institution signed the contract with the INSS, that made it able to give payroll loans for retirees and pensioners and 0 otherwise. For the institutions that are not able such date is arbitrary, so we will estimate some models varying the threshold point.

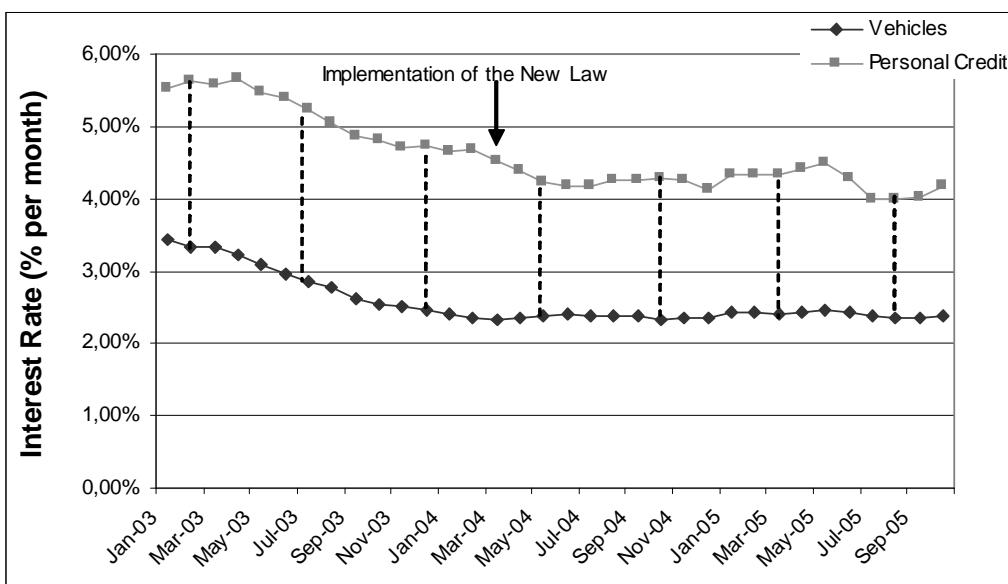
In this model,  $\beta$  is the difference-in-difference estimate of the (average) effect of new law of payroll loans on personal loans. The key identifying assumption for this interpretation is that the change in loans variables in control group is an unbiased estimate of the counterfactual. While we cannot directly test this assumption, we can test whether the secular time trends in the control and treatment variable of loans were the same in the preintervention periods. If the secular trends are the same in the preintervention periods, then it is likely that they would have been the same in the postintervention period if the treated type of loan had not suffered influence of the new law.

Figures 4 and 5 already suggest that the growth in interest rates and new loans in treatment (personal loans) and control (automobile loans) groups were the same before the new law take effect. Notice that for the period before the new law the path of both variables for the control group is similar to the treatment group, occurring a detach only after the new law implementation. This feature would indicate that the variable automobile loans could be a good control for the treatment group personal loans.

**Figure 4: Evolution of the New loans**



**Figure 5: Evolution of the Interest Rate**



We formally test the pre-intervention time trends for the treatment and control groups. We do this by testing the hypothesis that growth in new loans and interest rates for both groups was the same in the pre-new law period.<sup>13</sup> To conduct the test we regress changes in new loans and interest rates over the period January 2003–March 2004 against an indicator of the type of loan and dummies of month and cross-section characteristics. The hypothesis

<sup>13</sup>See Banerjee, Gertler and Ghatak (2002).

is rejected if the coefficient on the dummy of type of loans is significantly different from zero. The results are presented in column 1 and 2 of table 3. We cannot reject the hypothesis that growth in both variables was the same in both control and treatment groups in the pre–new law period.

**Table 3: Growth Rate (Difference)\***

	New Loans	Interest Rate
	OLS (1)	OLS (2)
Personal Loans (=1)	0.66 (0.49)	-0.07 (0.44)
Fixed Effect	Yes	Yes
Number of Obs.	1585	1585
Number of cross-sections	127	127
R-squared	0.17	0.07

\*p-value in parentheses  
Robust standard erros

#### 1.4.1. Direct Effects

In this subsection we analyze the direct effect of the new law. This effect is defined as the impact of the new law over the financial institutions that were authorized by the government to offer the payroll loans. In this case all financial institutions of the sample became able to offer payroll credit at different points of time (the month that the institution signed the contract with INSS).

The table 4 presents the estimation results of the equation (1.1) for both the dependent variables: new loans (R\$ millions) and interest rate (% per month). Column 1 report the direct effect of the new law on new personal loans. It is associated with an increase of R\$ 46.6 millions in the personal credit negotiated by the financial institutions allowed to offer the payroll loans. The average of new loans for this group before the new law was R\$57 millions, occurring an increase of R\$70 millions after the new law. Thus, approximately 67% of such increase was caused by the new law. The column 2 that presents the direct effect over the interest rate points to a decrease of 0.62% per month, which means a decrease of 7.4% per year. Comparing to the levels of interest rate for the this group before treatment period we



can say that the new law brought a reduction of approximately 11% in the rate (44% of the post-treatment total fall). Both estimations are statistically significant at 1% level.

Both effects are according to our expectations. The new law reduces the moral hazard problem, which increases the expected return of lenders due to the reduction of probability debtors' default. It induces the lenders to expand the supply of credit at better terms. In response to this improvement in the personal credit, debtors tend to demand such type of loans.

**Table 4: Difference-in-Difference Models for the direct effect\***

	New Loans (R\$ millions)	Interest Rate (% per month)
Personal Loans (=1)	46.6 (<0.01)	-0.62% (<0.01)
fixed effects	Yes	Yes
R <sup>2</sup>	0.91	0.93
Number of obs	1850	1627

\* p-value in parentheses

Robust standard errors

#### 1.4.2. Indirect Effects

In this subsection we analyze the indirect effect of the new law. This effect is defined as the impact of the new law on financial institutions that were not allowed to offer the payroll loans. Since the procedure of making financial institutions able to offer payroll loans is continuous through time,<sup>14</sup> we use as threshold point different dates to capture the new law's effect.

Tables 5 and 6 present the estimation results of the equation (1.1) for both dependent variables: interest rate (% per month) and new loans (R\$millions) respectively. Columns 1 to 4 of the table 5 report the results for interest rate varying the threshold point that defines the pre- and post-treatment period to the financial institutions that are not able to offer payroll loans. The indirect effect of the new law is associated with a decrease in the interest rate of personal loans varying from 0.41% to 0.43%. Comparing to the levels of interest rate for the this group before treatment period (5.5%) we can say that the new law produced, at

<sup>14</sup>See Table A1 at Appendix A.

most, a reduction of 7.8% in the rate (61% of the total fall, since the post-treatment interest rate is 4.8%). Also, the columns 1 to 4 of the table 6 show that the new law is associated with a reduction in the new personal loans, which increases – together with the number of financial institutions that provide payroll loans – from R\$ 14.1 millions to R\$19 millions. All results are highly significant.

**Table 5: Difference-in-Difference Models for the indirect effect  
Interest Rate (% per month)\***

	OLS (1)	OLS (2)	OLS (3)	OLS (4)
Personal Loans (=1)	-0.41% (<0.01)	-0.40% (<0.01)	-0.43% (<0.01)	-0.43% (<0.01)
fixed effects	Yes	Yes	Yes	Yes
Threshold Point	May 2004	September 2004	January 2005	May 2005
R <sup>2</sup>	0.88	0.88	0.88	0.88
Number of obs	3313	3313	3313	3313

\* p-value in parentheses  
Robust standard errors

**Table 6: Difference-in-Difference Models for the indirect effect  
New Loans (R\$ millions)\***

	OLS (1)	OLS (2)	OLS (3)	OLS (4)
Personal Loans (=1)	-14.1 (<0.01)	-15.9 (<0.01)	-16.1 (<0.01)	-19.0 (<0.01)
fixed effects	Yes	Yes	Yes	Yes
Threshold Point	May 2004	September 2004	January 2005	May 2005
R <sup>2</sup>	0.90	0.90	0.90	0.90
Number of obs	3709	3709	3709	3709

\* p-value in parentheses  
Robust standard errors

Notice that the indirect effect is instantaneous for both variables of personal loans. The intuition behind this result is that the volume of new loans decreases due to the migration of the clients from the financial institutions not authorized to supply payroll loans to institutions able to offer this type of credit, looking to change the more expensive credit to the cheaper loan. Since this movement represents a contraction in the demand for personal loans for such financial institutions, the equilibrium interest rate tends to reduce, as the empirical results indicates.

### 1.4.3. The General-Equilibrium Effects

The table 7 presents the estimation results of the equation (1.1) for the dependent variable interest rate (% per month). Columns 1 to 4 report the results varying the threshold point that defines the pre- and post-treatment period to the financial institutions that are not able to offer payroll loans. The effect of the new law is instantaneous on interest rate. In equilibrium, the new law is associated with a decrease in the interest rate of personal loans varying from 0.34% (threshold in May 2004) to 0.52% (threshold in May 2005), with all cases being statistically significant at 1%. Comparing to the levels of interest rate for the treatment group before treatment period we can say that the new law produced, at most, a reduction of 10.3% in the rate (58% of the total fall).

Table 8 presents the diff-in-diff coefficient results for new personal loans variable (R\$ millions). Columns 1 to 3 report the results for new loans as dependent variable varying the threshold point that defines the pre- and post-treatment period to the financial institutions that are not able to offer payroll loans. We find that, in equilibrium, the new law is associated with an increase in the new personal loans from January 2005 on, which grow through the time from R\$ 5.9 millions to R\$13.8 millions. As we showed previously, the average of new loans for the treatment group before the new law was R\$35.4 millions, occurring an increase of R\$33.3 millions after the new law. Thus, the new law is responsible for approximately an increase of 42% in the new loans.

Differently from the interest rate, we notice that in this case the impact of the new law has a delay. We can explain this feature coming from three different sources: first, the initial debtors' behavior could be the migration between the both groups of financial institutions, increasing the demand for payroll loans from institutions able to supply it to repay more expensive personal loans to institutions not authorized to offer such credit, which implies that - in the aggregated level - the personal loans does not suffers any change in quantity; second, the number of financial institutions that are allowed to offer payroll loans increases

through the time<sup>15</sup>; and finally, the time to spread the information about this new technology of loans may be slow.

However, the final effect is according to the expectations. Such law helps to complete the contingent markets once it brings the possibility of people making contracts of future payments conditioned to future cash flow. It reduces the number of states of nature in which financial institutions would lost their money due to moral hazard actions, stimulating the supply of credit. All this factors make the volume of new loans increase. Since the new law vanishes a significant part of the default, the financial institutions will be repaid in more states of nature, increasing their expected value to be recovered. Thus, since the creditors will be repaid in a bigger share of states of nature, the cost of credit falls. These results show the potential improvements in social welfare that this law may produce.

**Table 7: Difference-in-Difference Models of Interest Rate (% per month)\***

	OLS (1)	OLS (2)	OLS (3)	OLS (4)
Personal Loans (=1)	-0.34% (<0.01)	-0.36% (<0.01)	-0.42% (<0.01)	-0.52% (<0.01)
fixed effects	Yes	Yes	Yes	Yes
Threshold Point	May 2004	September 2004	January 2005	May 2005
R <sup>2</sup>	0.90	0.90	0.90	0.90
Number of obs	4940	4940	4940	4940

\* p-value in parentheses

Robust standard errors

**Table 8: Difference-in-Difference Models of New Loans (R\$ millions)\***

	OLS (1)	OLS (2)	OLS (3)
Personal Loans (=1)	5.9 (<0.05)	8.2 (<0.05)	13.8 (<0.01)
fixed effects	Yes	Yes	Yes
Threshold Point	January 2005	March 2005	May 2005
R <sup>2</sup>	0.90	0.90	0.90
Number of obs	5559	5559	5559

\* p-value in parentheses

Robust standard errors

<sup>15</sup>See Table A at the Appendix A.

Using the difference-in-difference methodology we are able to take out the bias of a "pure estimator". We showed in later section that the new loans' volume increased for both treatment and control group between pre- and post-treatment periods. So it is important to control for this generalized trend of growth in the credit market through the use of this estimator. The results show that even controlling for common temporal trends and for cross-section heterogeneity (the time and cross section fixed effects) the new law's effect on new loans is economically and statistically significant. It means the new loans' growth between pre- and post-treatment periods was much bigger for treatment group than for control group even when we control for these factors.

The economic improvement that the new law brought by eliminating part of the moral hazard was not only statistical but also economic significant. Thus, this findings allow us to notice how costly is informational failures.

### **1.5. Conclusion**

The new Brazilian law of payroll loans, launched in September 2003, provides a natural experiment on personal credit, since it was an exogenous change that affected only a specific type of loans: the payroll loans. The payroll loan is a type of personal credit with repayments directly deducted from the borrowers' payroll check, which, in practice, makes a collateral out of future income.

The new law provides to creditors the capacity to receive their loans' repayment immediately, whenever the debtors have enough income to do it. Thus, such type of loan eliminates a significant part of the strategic default, diminishing the informational failure costs, as moral hazard. Theoretically, financial institutions will be more willing to offer better terms of credit since the expected value of the loan's repayment increases due to the lower probability of default.

The empirical methodology applied to identify the average effect of the new law on personal credit – accounting for general-equilibrium effects – was the difference-in-difference

procedure. The results point to an increase in the new loans and in the total amount of credit, and to a fall in the interest rate. In quantitative terms, our estimation indicates an increase of approximately 42% in the new loans and a decrease of 10.3% in the interest rate. Therefore, the main result of this paper shows that the information failures produces a significant economic cost in the personal credit market.

Besides the final impact over personal loans, we estimate both the direct and indirect effects of the new law. For the first we find that the new law caused an increase of R\$46 millions in new personal loans for institutions that are able to offer the payroll loans, while the second effect suffered a contrary effect, reducing their loans in R\$19 millions mainly due to the migration actions. The interest rate falls for both groups but for different reasons, for the first group the lower probability of default provide a higher expectations about recovery of the debt, which induces creditors to offer the credit at better terms, while for the second group a reduction in the demand forces the interest rate down.

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## 1.6. Appendix

May of 2004	1
September of 2004	1
November of 2004	4
December of 2004	6
January of 2005	3
March of 2005	2
April of 2005	5
May of 2005	5
June of 2005	5
August of 2005	8

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## CHAPTER 2

### **How much debtors' punishment?<sup>1</sup>**

#### **Abstract**

This paper investigates the relationship between creditors' protection - when it is directly determined by debtors' punishment - and the credit market development. The current literature stresses that creditor protection through the legal system is associated with a broader credit market in a monotone way. In this paper we show that if the creditors' protection is directly determined by the debtors' punishment there will be a non-monotonic relationship between the creditors' protection (or debtors' punishment) and the size of the credit market, where the optimal level of protection should be neither too high nor too low.

#### **2.1. Introduction**

Recent research in development of credit markets points to an important role of the legal protection to creditors in supporting these markets (e.g., La Porta et al. 1997 and Djankov et al. 2006). The current literature argues that creditor protection through the legal system is associated with a broader credit market in a monotone way, or simply the higher the protection to creditors the better is to the credit market.

In this paper we find that if the creditors' protection is directly determined by the debtors' punishment, such conclusion doesn't hold any more. In fact, there will be a non-monotonic relationship between the creditors' protection (or debtors' punishment) and the size of the credit market, where an intermediate level of protection is optimal for the development of such market.

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<sup>1</sup>This article was jointly made with Aloisio Araujo. I would like to thank Luis Henrique Braidó and João Manoel Pinho de Mello for helpful comments as well as seminar participants at EPGE/FGV, IBMEC-RJ, the 2006 European Meeting of the Econometric Society at Vienna and the 2006 Latin American Meeting of the Econometric Society at Mexico City.

Unlike the current literature, we assess this question comparing states in the U.S., taking advantage of changes provided by the Personal Bankruptcy Reform Act of 1978 that redefined the degree of penalty to debtors in case of bankruptcy. The new law allowed states to choose their own level of penalty, and most of them reduced it significantly after the reform, adopting widely varying penalty levels. This approach is also benefited from the lower level of heterogeneity that exists between states if compared with the former cross-country studies.

According to the Personal Bankruptcy Law, individuals – ordinary and firms’ owners – who file for personal bankruptcy under Chapter 7 are required to give up all assets that exceeds the applicable state-specific exemption levels, but are not required to devote any of their future income to debt repayment. In return for giving up nonexempt assets, they receive a discharge from most types of debts<sup>2</sup>. Thus, the exemption level can be seen as a debtors’ punishment variable that serves to protect creditors’ interests. The lower its level is, the harsher is the debtors’ punishment and the higher the creditors’ protection is.

Debtors are punished by losing a significant amount of their wealth, and at the limit, when the exemption is zero, they lose everything they own. In this situation, when markets are incomplete<sup>3</sup>, the fear of such harsh punishment in bankruptcy states makes debtors to avoid borrowing, reducing their demand for credit. On the other hand, lower exemptions increase the amount that creditors receive from debtors in bankruptcy, making them more likely to supply credit. As the bankruptcy exemption rises, the debtors have the option to tailor another asset, aligned with their personal interests, to substitute the original debt contract at a cost of the bankruptcy punishment, motivating them to demand credit, however it also makes debtors more willing to file for bankruptcy. On the other hand, higher bankruptcy

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<sup>2</sup>This is how the Personal Bankruptcy Law worked in the treated period. A recently-passed reform (from 2005) changed a little the discussed procedure. However it is expected only a small effect on the number and type of filings (See White 2006).

<sup>3</sup>The standard debt contract (non-contingent repayment of principal plus interest) that is usually offered to individuals and small businesses makes the market incomplete, since there is no contract that is offered contingent to the successful states of nature.

exemptions (or lower creditor protection) also reduce the amount that lenders receive in repayment of debt in bankruptcy states, making them more likely to refuse the credit offer.<sup>4</sup>

Observe that this legal instrument exerts an important influence on incentives related to bankruptcy decisions, and ensuing on forces that drive the demand and the supply of loans.

Thus, this paper aims at answering the following issues: Is the relationship between creditors' protection (or debtors' punishment) and the credit market development described by a non-monotonic shape? Is the optimal level of punishment intermediary? What is such an optimal level?

To reach our goals, first we present a theoretical approach that supports our empirical claims. Our model reflects certain features observed in the U.S. economy such as the possibility of debtors to file for bankruptcy strategically or by bad fortune and the punishment exogenously imposed by the bankruptcy law. Then, we simulate the model to analyze how the punishment affects the welfare and credit market. Finally, we estimate an econometric model of the effect of bankruptcy exemptions – that is the variable representing the creditors' protection (or debtors' punishment) – on the individuals and small businesses' private credit to Gross State Product ratio using aggregated data of loans and information on bankruptcy exemption in each state over the period 1992-1997, when several changes occurred on exemption levels.

As a result, we found a non-monotonic shape in the relationship between the level of creditors' protection and the amount of credit to both small businesses and individuals, as well the welfare. States with extreme levels of protection (high or low) tend to have a lower volume of credit relative to states with intermediary levels of protection. Thus, the

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<sup>4</sup>See Dubey, Geanakoplos and Shubik (2006): "An agent who defaults on a promise is in effect tailoring the given security and substituting a new security that is closer to his own needs, at a cost of bankruptcy penalty. With incomplete markets one set of assets may lead to a socially more desirable outcome than another set. Also, since each agent may be tailoring the same given asset to his special needs, one asset is in effect replaced by many assets as there are agents, and so the dimension of the asset span is greatly enlarged. A larger asset span is likely to improve the social welfare."

punishment applied by the bankruptcy legislation should be neither so harsh that inhibits credit demand nor so lenient that worsen the credit offer conditions.

The remainder of the article is organized as follows: section 2 discusses the literature review; section 3 discusses the personal bankruptcy law; section 4 presents the theoretical model; section 5 presents the empirical results; and section 6 concludes.

## 2.2. Literature Review

There are two distinct views of what determines how much private credit a financial system would extend to firms and individuals. For the first view, what matters for the development of private credit is the protection that the legal system provide to creditors. When lenders can more easily force repayment they are more willing to extend credit. These "power" theories of credit have been formalized by Townsend (1979), Aghion and Bolton (1992), and Hart and Moore (1994, 1998). However, the theoretical motivation of this paper comes from Dubey, Geanakoplos and Shubik (1989, 2005) who built a general equilibrium model that explicitly allows the possibility of default. Their idea is to impose on the agents a penalty for default. The authors show that in presence of incomplete markets, assuming that certain contingencies cannot be written into contracts, the intermediate level of penalty that encourages some amount of bankruptcy provides a higher level of individuals' credit and welfare in the economy. Our paper approaches the debtors' problem using similar features like incomplete markets and the imposition of exogenous debtors penalty. In our model the bankruptcy exemption is the exogenous penalty imposed to debtors in case of bankruptcy. According to the second view, the information on debtors is what really matters for lending. When lenders have better information about borrowers, they are not as concerned about the problem of financing non-viable projects, and therefore extend more credit. These "information" theories of credit have been pioneered by Jaffe and Russell (1976) and Stiglitz and Weiss (1981).

For empirical studies on power theories of credit, La Porta, Silanes, Shleifer and Vishny (1997, 1998) construct a measure of legal rights of creditors, called creditor rights. The index measures the legal rights of creditors against defaulting debtors in different countries, and has been previously interpreted as a measure of creditor protection. For theories of information on credit, Jappelli and Pagano (2000, 2002), Pagano and Jappelli (1993) and Sapienza (2002) have shown the importance of this factor in the determination of credit availability. They use data of credit registries – information on credit histories and current indebtedness of various borrowers – to assess empirically this issue.

Our study contributes for the first view: the "power" theory of credit. Pioneering, La Porta et al (1997) produced a study about legal determinants for financing. They use cross-country regressions to suggest that the bigger the creditor protection is, the higher is the amount of private debt. Djankov et al (2006), analyzing both theories together and using a larger sample of countries, found that more creditor protection and better information sharing are associated with broader credit market. In addition, they found that private credit to GDP ratio rises following either improvements in creditor rights or the introduction of credit registries. Our paper, in contrast, analyzes the creditors' protection when it is directly determined by the debtors' punishment. To assess this question we compare the levels of punishment decreed by each state in the U.S., taking advantage of changes provided by the Personal Bankruptcy Reform Act of 1978 that redefined the degree of penalty to debtors in case of bankruptcy. Contrary from the other authors, we find that the relationship between creditors' protection and the size of the credit market not always increasing, in fact, there will be an intermediate level of creditors' protection that is optimal for the credit market development.

### **2.3. Personal Bankruptcy Law and the 1978 Reform Act**

The personal bankruptcy procedures apply directly to individuals and small businesses. The reason of why the personal bankruptcy law applies to small business, and not just to

individuals, is because when a firm is noncorporate, its debts are personal liabilities of the firm's owner, so that lending to the firm is legally equivalent to lend to the owner. If the firm fails, the owner can file for bankruptcy and her business and unsecured personal debts will be discharged. When a firm is a corporation, limited liability implies that the owner is not legally responsible for the firm's debts. However, lenders may require, and they usually do, that the owner guarantee the loan with some personal good (second mortgage for example). Thus, personal bankruptcy law applies to noncorporate businesses and may also apply to small corporate business.

When individuals and unincorporated firms<sup>5</sup> file under Chapter 7 of the U.S. Bankruptcy Code, they receive a discharge from unsecured personal and business debt in return for giving up assets in excess of the relevant state's bankruptcy exemption.<sup>6</sup> Creditors may not enforce claims against debtors' assets if the assets are covered by Chapter 7 bankruptcy exemption and legal actions to obtain repayment. This provision prevents creditors from taking a blanket security interest in all debtors' possessions.

Personal bankruptcy law became much more favorable to debtors following the passage of 1978 Bankruptcy Reform Act. Prior to 1978, bankruptcy exemptions were specified by states and usually tended to be very low. The Commission on the Bankruptcy Laws of the U.S. argued that a high and uniform bankruptcy exemption would be beneficial to less-well-off individuals. Due to harsh collection practices by creditors, debtors often found it difficult to recover from these setbacks and would suffer further adverse consequences such as bad health, family strain, divorce, job loss and for small businesses' owners difficulty to restart a new businesses, unless a generous exemption in bankruptcy left them with adequate assets for a "fresh start". While the House adopted the Commission's populist view, the Senate preferred to continue allowing the states to set their own bankruptcy exemptions.

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<sup>5</sup>Owners, typically, have high debt levels, much of which consists of debts of the failed firm.

<sup>6</sup>Most states have several types of exemptions like residence exemption (homestead exemption), personal propriety exemption (like equity in cars, furniture, jewelry and cash) and wild card (where the debtor chooses anything to be exempted until some fixed value). Usually, the homestead exemption is the largest, and other exemptions are small.

For such conflicts between the House and the Senate the solution was to specify a uniform bankruptcy exemption<sup>7</sup>, allowing states to opt out of the federal exemption by adopting their own bankruptcy exemption. By 1983 all the states had done so, although one third of the states allowed debtors to choose between states and Federal bankruptcy exemptions. Many states raised significantly their bankruptcy exemptions when they passed opt-out legislation, adopting widely varying exemption levels. In 1992 the lowest bankruptcy exemption level was in Maryland with no homestead exemption and USD 5,500 of personal bankruptcy exemption, while Texas' exemption was unlimited for homestead and USD 30,000 for personal property.

There is also a second bankruptcy procedure, called Chapter 13, and debtors are allowed to choose between them. Under Chapter 13, debtors must present a plan to use some of their future earnings to repay part or their total debt, but all their assets are exempt. Debtors generally have an incentive to choose Chapter 7 rather than Chapter 13 whenever their assets are less than bankruptcy exemptions, because doing so allows them to avoid repayment debt from either assets or future income. Because many states' exemption levels are high relative to the assets of typical person who file for bankruptcy, around 70 percent of all bankruptcy filings occur under Chapter 7<sup>8</sup>. Even when debtors file under Chapter 13, the amount that they are willing to repay is strongly affected by Chapter 7 bankruptcy exemption. Suppose, for example, that a person with assets of \$50,000 living in a state whose exemption level is \$35,000 considers filing for bankruptcy. Because the debtor would have to give up \$15,000 in assets if she filed under Chapter 7, she would be willing to pay no more than \$15,000 (in present value) from future income if she filed under Chapter 13. As a result of this close relationship between both chapters, we ignore the distinction between them.

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<sup>7</sup>USD 7,500 for homestead exemption, USD 4000 for personal property exemption, doubling when married couples filed for bankruptcy.

<sup>8</sup>See Barron and Staten (1997)

Now consider the set of small but incorporated firms. Corporate firms are legally separated from their owners, so owners are not personally responsible for debts of their corporations. Holding everything constant, this means that small corporations are less creditworthy than small unincorporated firms, because the former have only the corporations assets to back up business debt, while the latter have both the firm's assets and the owner's personal assets. Lenders also know that owners of small corporations can easily shift assets between their personal accounts and their corporations accounts, so that lenders may not view the corporation/noncorporation distinction as meaningful for small firms. In making loans to small corporations, lenders therefore may require that owners personally guarantee the loans. This abolishes the legal distinction between corporation and their owners for purposes of the particular loan and puts the owner's personal assets at risk to repay the loan.

Debts can be divided into two different categories: secured and unsecured loans. Unsecured debts would seem more likely to be affected by bankruptcy exemption than secured debts. In particular, this distinction is blurred and debtors are often able to arbitrage assets and debts across categories and thereby increase their financial benefit from bankruptcy. For example, debtors might borrow on their credit cards or obtain new consumer loans in order to reduce secured credit. These transactions convert nondischargeable secured debt into unsecured debt that is dischargeable in bankruptcy. Or debtors might sell personal property that is in excess of the personal property exempt and use the proceeds to reduce their mortgage or to buy exempted property. In addition, bankruptcy undermines the value of collateral to lenders, since lenders may be delayed in repossessing it or may be unable to repossess the collateral at all (for example, if they call to repossess an asset that they do not provide money to finance its purchase)<sup>9</sup>. Also, lenders incur extra legal costs because they must obtain the

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<sup>9</sup>In relation to debtors' home, they may be able to get rid of some lien (junior creditors, like second mortgages) without paying a cent to the lienholder. In some states, if debtors' home is sold in bankruptcy, they will get their homestead amount ahead of junior secured creditors holding judicial liens. Debtors can get rid of the lien created by judgment by filing a "motion to avoid a judicial lien". They may also be able to get rid of some liens by filing separate lawsuit in bankruptcy court. See Elias, Renauer, Leonard and Michon (2004)



permission of the bankruptcy trustee in order to repossess collateral. For these reasons we examine the effects of bankruptcy exemptions on total loans rather than on unsecured loans.

## 2.4. Theory

In this section we build a model that describes how the debtors' decision for bankruptcy develops, considering the different levels of punishment provided by the value of the bankruptcy exemption imposed by the local law. We present in the first part the case for individuals, and in the second part the case for small businesses.

### 2.4.1. Individuals' Model

Consider a consumer who lives for two periods and maximizes utility over her consumption  $c$ . The consumer is born with some amount of durable goods of value  $D$  (like a house, a car, etc) that she consumes in both periods, but it depreciates at rate  $\delta$ . Period 1 income  $w_1$  is observed but the second period income is uncertain, varying according to the realization of the states of nature, thus  $w_{2s} \in [w_{21}, \dots, w_{2S}]$ . Each state occurs with probability  $p_s$ , where  $p_s > 0 \forall s$  and  $\sum_s p_s = 1$ . The wage is freely observed by the borrower, but the lender may verify its value at a monitoring cost proportional to the borrowed amount  $B$ . The monitoring cost will be denoted by  $\gamma B$ .

There is a large number of agents divided in two different groups: borrowers and lenders. Borrowers may be thought as consumers and lenders as the financial institution that offers a standard debt contract<sup>10</sup>. Each lender is endowed with enough money to supply credit to consumers. Such lenders' endowment may be used either to lend to a borrower with rate  $r$ , or to purchase a risky-free asset paying an exogenously given rate of return  $r_f$ .

If the borrowers report bankruptcy, part of the debt will be discharged, and some of the individuals' assets, including personal goods ( $D$ ) and their present income will be exempted

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<sup>10</sup>Townsend (1979) and Williamson (1986,1987) show that the standard debt contract is the optimal contract for competitive financial market condition. Ying Yan (1996) shows that the standard debt contract is the optimal debt contract for non-competitive financial market condition.

up to the amount  $E$ . The bankruptcy law determines the level of  $E$  exogenously, and accordingly we call  $E$  the bankruptcy exemption level in this paper. The debt contract is subject to this bankruptcy law. Notice that part of borrowers' goods serves as an informal collateral imposed by the law to unsecured credit.

**Definition 1:** *Strategic bankruptcy*<sup>11</sup>: It occurs when the borrower has enough wealth to pay her debts but she chooses not to do it.

**Definition 2:** *Bankruptcy by bad fortune*: It occurs when the realization of states of nature is bad in such way that borrowers are unable to fulfill their repayment promises.

The consumption of the first period defines the level of debt  $B$  at the beginning of period 2:

$$B = (c_1 - D - w_1),$$

which means that the agent consumes more than the sum of her wage and durable goods.

A loan contract between the borrower and the lender consists of a pair  $(r, B)$ , where  $B$  is the loan volume and  $(1 + r)$  the loan rate, subject to the legal imposition on the exemption level  $E$  that applies to the situation in which the borrower does not repay the debt  $(1 + r)B$ .

If at least some debt will be held, so that  $B > 0$ , we can divide the borrowers' actions in three distinct choices:

**C1:** does not file for bankruptcy if:  $w_{2s} + \delta D \geq (1 + r)B$  and  $(1 + r)B \leq \max(w_{2s} + \delta D - E, 0)$

**C2:** strategic bankruptcy if:  $w_{2s} + \delta D \geq (1 + r)B$  and  $(1 + r)B > \max(w_{2s} + \delta D - E, 0)$

**C3:** bad fortune bankruptcy if:  $w_{2s} + \delta D < (1 + r)B$  (and therefore  $(1 + r)B > \max(w_{2s} + \delta D - E, 0)$ )

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<sup>11</sup>Moral hazard enters the picture because borrowers have a choice not to repay their debts.

Analyzing the consumer choice for bankruptcy, it is optimal to file for bankruptcy if and only if their gains in bankruptcy are bigger than their gains when they choose not to file for bankruptcy, i.e., if and only if  $(1+r)B > \max(w_{2s} + \delta D - E, 0)$ . That is, the consumer will default whenever the second period debt exceeds the level of assets that can be seized and the debt can not be fully enforced. Therefore the consumer delivery  $\min[(1+r)B, \max(w_{2s} + \delta D - E, 0)]$ . This way, we can view the probability of no bankruptcy as  $(1 - p_{\text{bankruptcy}}) = p(C1) = \sum_s p_s \iota_s (1 - \iota_d)$  and the probability of bankruptcy as  $p_{\text{bankruptcy}} = p(C2) + p(C3) = \sum_s p_s [\iota_s \iota_d + (1 - \iota_s)]$ , where  $\iota_s = 1$  if  $w_{2s} + \delta D \geq (1+r)B$  and  $\iota_d = 1$  if  $(1+r)B > \max(w_{2s} + \delta D - E, 0)$ .

The wealth in each situation for the borrowers is given as follows:

$$W_2 = \begin{cases} w_2 + \delta D - (1+r)B & \text{if no bankruptcy} \\ w_2 + \delta D - \max(w_{2s} + \delta D - E, 0) & \text{if bankruptcy.} \end{cases}$$

Thus the lender can receive in case of bankruptcy a payment between  $w_{2s} + \delta D$  (if the bankruptcy exemption is zero) and zero (if the bankruptcy exemption overcomes the debtors' wealth in the second period).

For the lenders, the expected return on lending must be no less than the risk-free return.

Therefore, the lender's participation constraint is:

$$(2.1) \quad (1+r_f)B \leq \sum_s p_s \iota_s (1 - \iota_d)(1+r)B + \sum_s p_s [\iota_s \iota_d + (1 - \iota_s)] [\max(w_{2s} + \delta D - E, 0) - \gamma B];$$

The extra interest rate paid  $r - r_f$  is exactly the one needed to offset the loss the financial institution makes when the consumer defaults: it is the same as a risk premium.

For a menu of the described contracts, the consumer chooses a pair  $(r, B)$  that maximizes her expected utility function.

$$\max_{(r,B)} Eu(c) = u(c_1) + \theta \left[ \sum_{s=1}^S p_s u(c_{2s}) \right]$$

st (2.1) and

$$c_1 = w_1 + D + B$$

$$c_{2s} = w_{2s} + \delta D - \min[(1+r)B, \max(w_{2s} + \delta D - E, 0)] \quad \forall s$$

The constraint (2.1) is always valid with equality, since a smaller rate of return  $r$  makes the borrower strictly better and still makes the lender's participation constraint valid. Also, since the lender pays the monitoring cost to verify the wage value ( $w$ ) in default states, the contract specified above is incentive-compatible in the sense that borrowers do not have incentive in declaring a false state of nature.

Observe that the lenders' expected return, described by their participation constraint, determines the supply of credit in the economy. The supply of credit depends directly on the punishment level imposed by the local legislation. Intuitively, for  $E$  equal to zero, i.e. there is no exemption for borrowers, it rules out the possibility of strategic bankruptcy and increases the seizure of debtors' goods, raising the possibility of fulfillment of debtors' payment promises and consequently diminishing the cost of credit ( $r$ ). As  $E$  increases the number of the states of nature in which the borrower does not default reduces, since the bigger the exemption level is, the lower is the possibility that the income value plus borrower's goods overcome the exemption level, increasing the possibility of strategic bankruptcy. Such excess of strategic bankruptcy increases the interest rate charged to the loans, and at the limit, the borrower has incentive to file for strategic bankruptcy in every state and the supply of credit goes to zero.

**Proposition 1.** *Any value of exemptions above the critical value  $E^*$  makes the supply of credit to individuals zero.*

**Proof.** See Appendix A. □

**Proposition 2.** *As the bankruptcy exemption decreases, the interest rate charged to individuals reduces.*

**Proof.** See Appendix A. □

Differently from the supply side, if the bankruptcy exemption increases (reducing the debtors' punishment), the consumer has more incentive to demand credit. This happens because the cost to build another asset that is more aligned with debtors interests reduces, since they can keep a bigger amount of their personal goods if bankruptcy occurs. Such asset – that allows debtors to default at a cost of their wealth less the bankruptcy exemption – acts to substitute the original debt contract. At the limit, if the exemption is unlimited, the cost of bankruptcy goes to zero, making the demand for credit even more attractive. On the other hand, if the bankruptcy exemption goes to zero, individuals can lose everything they have in case of a bad realization of the state of nature, inhibiting their demand for credit.

**Proposition 3.** *As the bankruptcy exemption rises, the individuals' demand for credit increases.*

**Proof.** See Appendix A. □

Therefore, there are two distinct forces acting in the proposed problem. If  $E$  decreases, the supply of credit is motivated, reducing the interest rate charged to borrowers, since the chances of creditors being repaid are bigger. On the other hand, the demand is repressed since the debtors fear the punishment for losing their goods. With an increase of  $E$  there is an incentive to consumers demand credit since they can build assets aligned with their needs.

On the other hand, such level of exemption inhibits the lenders' supply of credit since the chance and the amount of repayment fall.

Thus, there is a trade-off that concerns the choice of the exemption level: higher levels of exemption increase the demand of credit but also stimulate the moral hazard problem, lowering the supply of credit; on the other hand, lower levels of exemptions mitigate the moral hazard problem - what motivates the supply of credit - but this also has a negative effect on the demand side due to the fear of harsh punishment. The equilibrium level of credit provided by extreme levels of bankruptcy exemption (0 or unlimited) tends to be very low or even zero. An optimal level of bankruptcy exemption  $E^*$  may exist where the the equilibrium of supply and demand of credit provide a higher level of credit and welfare in the economy.

*The Simulation of the Equilibrium*

Through the simulation method we intend to show how the equilibrium values of credit and welfare change as the bankruptcy exemption varies.

To simulate the model we simplify the setup described before. Now, the model has two periods, two states of nature in the second period ( $s = H, L$ ) and two types of agents (lenders and borrowers). The lenders are risk-neutral and the consumers are risk-averse with logarithm utility function.

The debtors' problem is:

$$\max_{r, B} Eu(c) = \ln(c_1) + \theta [p_L \ln(c_{2L}) + p_H \ln(c_{2H})]$$

st (2.1), and

$$c_1 = w_1 + D + B$$

$$c_L = w_{2L} + \delta D - \min[(1+r)B, \max(w_{2L} + \delta D - E, 0)]$$

$$c_H = w_{2H} + \delta D - \min[(1+r)B, \max(w_{2H} + \delta D - E, 0)]$$

The model simulation will be done according to the following value of parameters:  $w_1 = 0.5$ ,  $w_{2H} = 1.5$ ,  $w_{2L} = 0.5$ ,  $D = 0.3$ ,  $\delta = 0.9$ ,  $p_H = p_L = 0.5$ ,  $\theta = 0.95$ ,  $\gamma = 0.01$  and  $r_f = 1.05$ . We can interpret such wage values as the one of a person who is employed receiving 0.5 and expects a promotion for a better job that pays 1.5. The promotion occurs with probability of 0.5. Only the parameter  $E$  will be varying.

The simulation results (see table 1) tell us that extremely low and high levels of debtors' punishment provide a small volume of credit negotiated in the economy. The demand for credit is inhibited since the punishment is very harsh when the exemptions are very low (see proposition 3), making the consumers lose a significant share of their goods in bankruptcy states. As the exemption level increases, the amount of credit and welfare rise, reaching its maximal level when the bankruptcy exemption is equal to 0.77. Increasing even more the exemption level, the welfare and the volume of credit decrease - considering that the supply is inhibited due to the major possibilities of strategic bankruptcy and lower recoveries in bankruptcy states - and the interest rates charged to individuals increases (see proposition 1 and 2). Thus, the volume of equilibrium of the credit  $B$  is a non-monotonic function of the bankruptcy exemption levels  $E$ , where the optimal level of exemption is intermediary, providing a punishment neither too harsh nor too lenient.

**Table 1: Simulation Results - Individuals**

$E$	$B$	$(1+r)$	$E(u)$
0	0.12	1.05	-0.05
0.77	0.31	2.11	0.03
1.50	0.13	>2.11	-0.03
>1.77	0.00	-	-0.07

#### 2.4.2. Small Businesses' Model

Now, there is only one time period, where the small firms' owners choose the necessary amount of capital  $B$  to invest in their investment project. Then, a random amount of output

is produced by the borrower's project. Finally, the payment specified by contract and the consumption occur.

Each investment project requires capital as input to begin its operation, then it produces a random amount  $wB^\alpha$ , where  $w$  is the random variable,  $B$  is the amount that was borrowed and invested in the project. The output, that is uncertain, varies according to the realization of the states of nature  $w_s \in [w_1, w_S]$ . Each state occurs with probability  $p_s$ , where  $p_s > 0$   $\forall s$  and  $\sum_s p_s = 1$ . As before, the project return is free observed by the borrower, but the lender may verify the return at a monitoring cost proportional to the borrowed amount  $B$ . The monitoring cost will be denoted by  $\gamma B$ .

There is a large number of agents divided in two different groups: borrowers and lenders. Here, borrowers may be thought of as entrepreneurs of small firms. Lenders and borrowers differ in their preferences, their access to capital, and their access to the investment technology. Each lender is endowed with the capital input that can be used to put the entrepreneur's project in operation. If it happens, they lend their capital to the borrowers with rate  $r$ , otherwise they purchase a risky-free asset paying an exogenously given rate of return  $r_f$ . Each borrower is endowed with an investment project, but none of the capital input required to operate the project initially. Also borrowers own an amount of tangible goods denoted by  $D$  that can not be used as capital input.

The loan contract between the borrower and the lender consists in a pair  $(r, B)$ . If the entrepreneur reports bankruptcy, part of the debt will be discharged, and some of the total assets, including personal goods ( $D$ ), will be exempted up to the amount  $E$ .

If at least some debt will be held by the firms' owners, so that  $B > 0$ , we can divide their actions in three distinct choices:

**C1:** does not file for bankruptcy if:  $w_s B^\alpha + D \geq (1+r)B$  and  $(1+r)B \leq \max(w_s B^\alpha + D - E, 0)$

**C2:** strategic bankruptcy if:  $w_s B^\alpha + D \geq (1+r)B$  and  $(1+r)B > \max(w_s B^\alpha + D - E, 0)$



**C3:** bad fortune bankruptcy if:  $w_s B^\alpha + D < (1 + r)B$ .

Thus, the lender's participation constraint is:

$$(2.2) \quad (1 + r_f)B \leq \sum_s p_s \iota_s (1 - \iota_d) (1 + r)B + \\ + \sum_s p_s [\iota_s \iota_d + (1 - \iota_s)] [\max(w_s B^\alpha + D - E, 0) - \gamma B];$$

where  $\iota_s = 1$  if  $w_s B^\alpha + D \geq (1 + r)B$  and  $\iota_d = 1$  if  $(1 + r)B > \max(w_s B^\alpha + D - E, 0)$ .

For a menu of the described contracts, the entrepreneur chooses a pair  $(r, B)$  that maximizes his expected utility function.

$$\max_{(r, B)} Eu(c_s) = \sum_{s=1}^S p_s u(c_s)$$

st (2.2) and

$$(2.3) \quad c_s = w_s B^\alpha + D - \min[(1 + r)B, \max(w_s B^\alpha + D - E, 0)] \quad \forall s$$

The constraint (2.2) is always valid with equality, since a smaller rate of return  $r$  makes the borrower strictly better and still makes valid the lender's participation constraint. Since the lender pays the monitoring cost to verify the productivity ( $w$ ) in default states, the contract specified above is incentive-compatible in the sense that borrowers do not have incentive in declaring a false state of nature.

The supply of credit, which is described by the lenders' participation constraint, depends directly from the exemption level imposed by local legislation. The intuition of individuals' case works perfectly here, where the higher level of bankruptcy exemption acts to increase the number of states of nature that debtors file for strategic default and to reduce the recovery of

lenders in bankruptcy, increasing the interest rate charged by them. At the limit, the supply of credit disappears.

**Proposition 4.** *Any value of exemptions above the critical value  $E^*$  makes the supply of credit to small businesses zero.*

**Proof.** See Appendix A. □

**Proposition 5.** *As the bankruptcy exemption decreases, the interest rate charged to small businesses reduces.*

**Proof.** See Appendix A. □

The bankruptcy exemption value also has a strong effect on the entrepreneurs' demand for credit. For lower levels of bankruptcy exemptions (higher levels of punishment) the entrepreneurs may avoid demand for credit, fearing a bad realization of the states of nature. This happens because for  $w$  sufficiently low, the borrower does not have enough wealth to fulfill the repayment promise, i.e.  $wB^\alpha + D < (1 + r)B$ , leaving to the firm's owner a small amount (or even nothing) of her wealth, practically eliminating the possibility of a fresh re-start. Conversely, as the bankruptcy exemption increases, the entrepreneurs tend to keep a significant part of their goods and gains from production if bankruptcy occurs, motivating their demand for credit since the loan contract despite be a standard can be modified (not being paid in the bad states of nature) at a lower cost.

**Proposition 6.** *As the bankruptcy exemption rises, the small businesses' demand for credit increases.*

**Proof.** See Appendix A. □

As the individuals' problem, there are two distinct forces acting in this situation: the supply of credit that is boosted when  $E$  decreases and inhibited when it increases, and the demand of credit that has the inverse behavior. The existing trade-off between strategic

bankruptcy and the level of credit provide a non-monotonic shape in the relation between bankruptcy exemptions and small businesses' credit and welfare. As we will see next, in equilibrium the level of credit provided by extreme levels of exemption (0 or  $\infty$ ) tends to be very low or even zero, while the maximal level of credit and welfare occurs when the level of bankruptcy exemption  $E$  is intermediary.

*The Simulation of the Equilibrium*

To simulate the model we made the same simplifications as the individuals' case: two states of nature and two types of agents where lenders are risk-neutral and entrepreneurs are risk-averse with logarithm utility function.

The entrepreneurs' problem is:

$$\max_{r,B} E \log(c) = p_H \log(c_H) + p_L \log(c_L)$$

st (2.2), and

$$c_L = w_L B^\alpha + D - \min[(1+r)B, \max(w_L B^\alpha + D - E, 0)]$$

$$c_H = w_H B^\alpha + D - \min[(1+r)B, \max(w_H B^\alpha + D - E, 0)]$$

The model simulation will be done according to the following value of parameters:  $\alpha = 0.3, D = 0.3, p_H = p_L = 0.5, w_H = 1.5, w_L = 0.5, (1+r_f) = 1.05$  and  $\gamma = 0.01$ . Again, only the parameter  $E$  will be varying.

**Table 2: Simulation Results - Small Businesses**

$E$	$B$	$(1+r)$	$E(u)$
0	0.12	1.05	-0.43
0.70	0.19	2.11	-0.35
0.83	0.06	>2.11	-0.42
>1	0.00	-	-1.20

The same intuition used for individuals can be applied here. Simulation results tell us that lower levels of exemption inhibit the demand of credit, since the harsh punishment eliminates the possibility of fresh re-start, as the proposition 6 showed. As the exemption level increases, the amount of credit negotiated and welfare rise, reaching its maximal level.

Even considering the increase in the interest rates, the possibility of entrepreneurs save some amount of their goods in case of bad state of nature make them more willing to demand credit, which raises their expected utility. Increasing even more the exemption level the welfare and the volume of credit decrease, once the terms of credit deteriorate due to the major possibilities of strategic bankruptcy. Thus, the equilibrium of the volume of credit  $B$  is a non-monotonic function of the exemption levels  $E$ .

## 2.5. Empirical Tests

In this study we use data from 1992 to 1997 from the *Federal Deposit Insurance Corporation Statistics on Banking* (FDIC) for small businesses and individuals' loans in each U.S. state and information on states' bankruptcy exemption to examine the empirical hypothesis. Comparing each state, we have 51 observations for a cross-section analysis. Since several changes happened in the levels of bankruptcy exemptions (which determine the debtors' punishment) during the period 1992-1997<sup>12</sup>, we will test the relationship between the degree of punishment and the level of individuals and small businesses' loans using a pooled cross-section method, raising the sample to 306 observations.

Most states have separate exemptions for equity in homesteads, personal property like equity in motor vehicles, some amount of cash, jewel, furniture, clothing etc, and miscellaneous category (wild card). Some states allow debtors to choose between the state's exemption and the Federal exemption, and for empirical tests we will use the bigger one. Also, some states allow married couples who file for bankruptcy to double (or raise) their exemptions. Because we are working with aggregated data, we assume that co-applicants are actually married couples<sup>13</sup> and we double (or otherwise raise) the exemptions in states that allow it. Table A in Appendix A lists the homestead, the personal property and the wild card exemptions in each state in 1992 and their changes until 1997. The table also indicates whether each

<sup>12</sup>See Table A in the appendix.

<sup>13</sup>As in Lin & White (2001) and Berkowitz & White (2004). Usually, more than 70% of debtors are married (Sullivan (1982)).

state allows its residents to use Federal exemptions and whether it allows married couples to double the exemption.

The structure of the bankruptcy law and its reform in 1978 benefited our estimation in two different ways: the first is because inside the U.S. there is a well-controlled institutional environment where the only issue that distinguishes the bankruptcy procedure in the American states is the level of bankruptcy exemption, which varies widely across states; second is that the reform in the Personal Bankruptcy Law in 1978 provides a neat natural experiment.

To run our tests we construct a debtors' punishment variable<sup>14</sup>. We can define debtors' protection as a sum of homestead, personal property and wildcard exemption, that is how much cannot be taken off from the debtor in case of bankruptcy<sup>15</sup>. Notice that this variable is inversely related to the penalty imposed on the debtors in their state, because the higher (lower) the debtor exemption, the less (more) the creditor can seize the debtors's goods. So this variable can be seen as the inverse of debtors' punishment (or the inverse of the creditors' protection). Normalizing the bankruptcy exemption by the lowest level and calculating its inverse, the variable used as the debtors' penalty is:

$$\text{Debtors' Punishment} = \frac{1}{\text{Normalized Exemption}} \in [0, 1].$$

The measures of the individuals' private credit that we use to run the regressions are:

$CCL$  = amount of credit card loans given by financial institutions to individuals divided by GSP,

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<sup>14</sup>The option to use this variable instead of bankruptcy exemption was made because the bankruptcy exemption itself does not affect uniformly the population. For example, the majority of the population is highly affected by exemptions from zero to US\$5,000, while exemptions above US\$200,000 have a weak effect on a small share of the population. The debtors' punishment variable works to fulfill this feature.

<sup>15</sup>For states that have an unlimited exemption level, we decided to impose a level of \$500,000 (quite above the highest level of exemption established by an American State, namely, \$100,000). To check the robustness of this hypothesis tests were done with values of \$250,000, \$1,000,000 and  $\infty$  (debtors' punishment equals zero) for unlimited bankruptcy exemptions. The regressions present only marginal changes compared with the last results and the variable of interest remains significant in all cases.

$PL$  = amount of personal loans<sup>16</sup> given by financial institutions to individuals divided by GSP,

$TIL = PL + CCL$  = total amount of loans given by financial institutions to individuals divided by GSP.

Concerning small businesses' private credit, the measures used to run the tests are:

$SBL1$  = amount of loans of \$100,000 or less given by financial institutions to small business divided by GSP,

$SBL2$  = amount of loans between \$100,000 and \$250,000 given by financial institutions to small business divided by GSP,

$SBL3$  = amount of loans between \$250,000 and \$1,000,000 given by financial institutions to small business divided by GSP,

$SBL = SBL1 + SBL2 + SBL3$  = amount of loans given by financial institutions to small business divided by GSP.

To investigate the non-linear shape of the relationship between debtors' punishment and each measure of loans we regress – with and without state and year fixed effects – the logarithm<sup>17</sup> of each measure of individuals and small businesses' private credit on the punishment variable, its square and other control variables.

To test our hypothesis, one possibility is to analyze whether differences in punishment levels across states affect the volume of credit. However, cross-section results are vulnerable to criticism because the punishment variables may be acting as proxies for nonbankruptcy variables at the state level which are omitted from the regression. The usual response to this problem in the program evaluation literature has been to use pooled cross-section or

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<sup>16</sup>Other loans to individuals for household, family and other personal expenditures (consumer loans) including single payment, installment and all student loans. Included are loans for such purposes as: (1) purchases of private passenger automobiles, pickup trucks, household appliances, furniture, trailers, and boats; (2) repairs or improvements to the borrower's residence (not secured by real estate); (3) educational expenses, including student loans; (4) medical expenses; (5) personal taxes; (6) vacations; (7) consolidation of personal (nonbusiness) debts; (8) purchases of real estate or mobile homes (not secured by real estate) to be used as a residence by the borrower's family; and (9) other personal expenditures.

<sup>17</sup>Because the distribution of individuals and small businesses' loans are right-skewed, we use the natural logarithm of individuals' loans as the dependent variable in our specification.

panel data rather than single year cross-section data and to introduce both state and year fixed effects<sup>18</sup>. Using pooled cross-section data and introducing state dummy variables into the estimation, the state dummies will capture the effect of variation across states in the punishment levels, while the punishment variable themselves will capture only the effects of changes in the punishment level between 1992 and 1997. We will report results using the following specifications:

$$(2.4) \quad \ln(L_{it}) = \alpha + \beta_1(\text{punishment}_{it}) + \beta_2(\text{punishment}_{it})^2 + \beta\mathbf{X}_{it} + \varepsilon_{it}$$

$$(2.5) \quad \ln(L_{it}) = \alpha_i + \psi_t + \beta_1(\text{punishment}_{it}) + \beta_2(\text{punishment}_{it})^2 + \beta\mathbf{X}_{it} + \varepsilon_{it}$$

The same monetary penalty could vary with each person, and a monetary penalization could be stronger the less income the agent owns. Therefore, it is possible to define a debtors' punishment variable as the inverse of the sum of homestead, personal property and wildcard exemption weighing up for each state per capita income because, for example, an exemption of \$10,000 in a rich state is a bigger penalty than the same exemption for a poor state. Let us call this variable as Effective Debtors' Punishment<sup>19</sup>. Then, we re-estimate the equations (2.4) and (2.5) for all measures of loans replacing debtors' punishment by effective debtors' punishment:

$$(2.6) \quad \ln(L_{it}) = \alpha + \beta_1(\text{ef.pun}_{it}) + \beta_2(\text{ef.pun}_{it})^2 + \beta\mathbf{X}_{it} + \varepsilon_{it}$$

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<sup>18</sup>The state fixed effects control for state-specific factors that are fixed over time, and the year fixed effects control for factors that vary over time but are common across all states.

<sup>19</sup>The range of this variable goes from zero to 5.5.

$$(2.7) \quad \ln(L_{it}) = \alpha_i + \psi_t + \beta_1(\text{ef.pun}_{it}) + \beta_2(\text{ef.pun}_{it})^2 + \beta \mathbf{X}_{it} + \varepsilon_{it}.$$

In the specification without fixed effects the vector of control variables is composed by GSP (in logs), population (in logs), unemployment rate of previous year<sup>20</sup> and dummies for American regions (Farwest is the excluded category)<sup>21</sup>. We control for total GSP on the theory that larger economies may have bigger credit markets because of economies of scale in organizing the supporting institutions. Inserting the population variable we also control by itself and for GSP per capita ( $\log(\text{GSP}) - \log(\text{population}) = \text{GSP per capita}$ ). The state unemployment rate in the previous year controls for the labor market activity and for the potential bankruptcy by bad fortune. Finally, we use dummy variables for regions to account for potential geographic variation in credit markets. Except for the dummies for regions, we use the same controls in the fixed effect specification because there may be some variation that is not state- and time-specific<sup>22</sup>.

But there exists an important econometric question: should the exemption levels be endogenous? Exemption levels can be treated as exogenous to the development of the credit-market. The U.S. Congress adopted a new Bankruptcy Code in 1978 which specified uniform federal bankruptcy exemptions that were applicable all over the United States, but also allowing states to opt out of the federal exemption by adopting their own bankruptcy exemption. The code went into effect in late 1979, and all the states adopted their own bankruptcy exemptions within a couple of years thereafter, although about one-third of the states allowed their residents to choose between the state's exemption and the federal exemption. Since the

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<sup>20</sup>The data source of Gross State Product (GSP), population and unemployment rate is the U.S. Bureau of Economic Analysis.

<sup>21</sup>The regions used as dummies are: Mideast, New England, Plains, Rocky Mountain, Southeast, Great Lakes, Southwest and Farwest.

<sup>22</sup>We also run the regressions without the controls, only with the fixed effects. The variables of interest present only marginal changes in their coefficient values and significance if compared with the specification that inserts the controls.



early 80s, the pattern has been that only a few states changed their exemption levels each year, mainly to correct nominal exemption levels for inflation. From 1992 to 1997, states changed their homestead exemptions 11 times and changed their personal property exemptions 10 times. Many of these changes were very small. In addition, the Federal bankruptcy exemption was raised in 1994 and this raised exemption levels in six states that allow their residents to use the Federal exemption. The fact that most states adopted their bankruptcy exemptions within a short period after the code went into effect and that few states changed their exemption levels each year suggests that individual states' bankruptcy exemptions can be treated as exogenous to the state credit market behavior.

### 2.5.1. Tests for Individuals' loans

Table 3 reports the coefficient values of running an ordinary least-squares, with and without state and years fixed effects, aiming at explaining the relationship between individual' credit market development and debtors' punishment (or creditors' protection). For all types of loans (personal loans, credit card loans and total individuals' loans) and econometric specifications, the coefficients describing debtors' punishment are highly significant, and since the first coefficient is positive and the second is negative, the relationship has a concave form.

Figure 1 (*TIL* with region dummies) that illustrates the non-monotonic shape of the studied relation shows that there is an intermediary penalty that is optimal for the development of the states credit market. Similar shapes hold for the other two measures of individuals' credit: credit card loans and personal loans.

Notice that as we claim in the theoretical section, there is an intermediary level of debtors' punishment – and consequently of creditors' protection – that maximizes the level of individuals' credit negotiated in the economy. For higher levels of punishment (lower exemptions) the demand for credit is inhibited since the debtors fear the consequences of bankruptcy (proposition 3), producing an underdevelopment in the individuals' private credit market. As the punishment reduces, the demand for credit is motivated due to the availability of a

new asset with the option of no-repayment at a lower cost (bankruptcy cost), and despite the terms of credit offered by the lenders tend to worsen (see proposition 2), the equilibrium level of credit will increase. As the punishment approaches to zero, the debtors higher incentive to file for bankruptcy strategically and the lower expected recovery of creditors reduces (or even kills) the supply of credit (see proposition 1). Therefore, there is an intermediary level that is optimal for the credit market development.

Table 3: OLS Regression - pooled cross-section with 306 observations

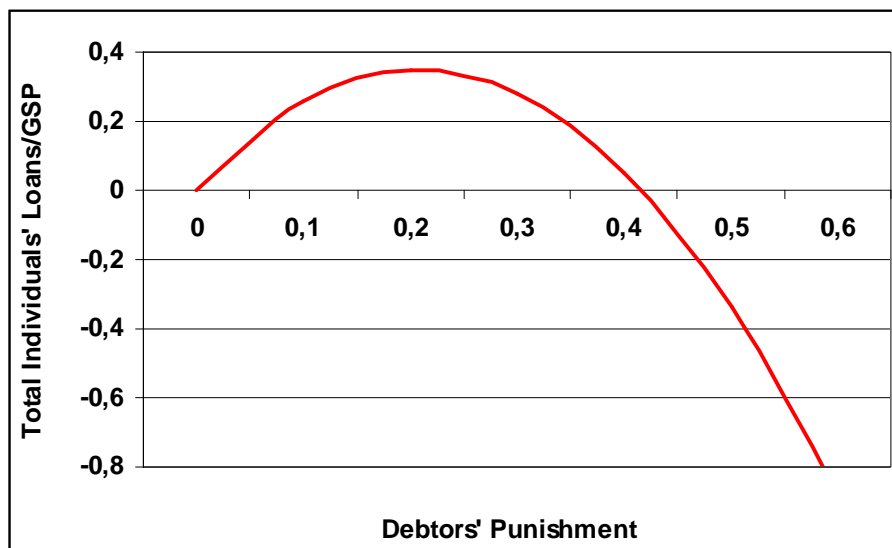
Dependent variable	<i>PL</i>		<i>CCL</i>		<i>TIL</i>	
constant	-10.20 <sup>a</sup> (0.75)	62.00 <sup>a</sup> (19.11)	-4.75 <sup>b</sup> (2.11)	-2.18 (35.08)	-5.80 <sup>a</sup> (1.34)	6.51 (23.47)
Debtors' Punishment	1.78 <sup>a</sup> (0.36)	3.99 <sup>a</sup> (1.12)	5.20 <sup>a</sup> (1.15)	5.67 <sup>c</sup> (2.95)	3.21 <sup>a</sup> (0.67)	3.35 <sup>b</sup> (1.56)
Debtors' Punishment <sup>2</sup>	-2.09 <sup>a</sup> (0.44)	-6.48 <sup>a</sup> (1.84)	-5.45 <sup>a</sup> (1.47)	-13.06 <sup>b</sup> (5.84)	-3.57 <sup>a</sup> (0.82)	-8.04 <sup>b</sup> (3.19)
ln(GSP)	-2.00 <sup>a</sup> (0.15)	1.25 (1.12)	-1.09 <sup>a</sup> (0.41)	1.98 (2.39)	-1.88 <sup>a</sup> (0.26)	2.13 (1.36)
ln(population)	1.99 <sup>a</sup> (0.15)	-5.91 <sup>a</sup> (2.01)	0.99 <sup>b</sup> (0.42)	-1.70 (3.66)	1.71 <sup>a</sup> (0.27)	-2.30 (2.42)
unemployment(-1)	-0.09 <sup>a</sup> (0.02)	-0.10 <sup>a</sup> (0.03)	-0.36 <sup>a</sup> (0.05)	-0.14 <sup>c</sup> (0.08)	-0.22 <sup>a</sup> (0.04)	-0.11 <sup>a</sup> (0.04)
Fixed Effects	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>
Dummies of regions	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>
R-square	0.56	0.82	0.23	0.85	0.35	0.87

Note: Standard errors and covariance robust to heteroskedasticity.

Standart errors are in parentheses.

a-significant at 1%, b-significant at 5%, c-significant at 10%.

Figure 1: Debtors' Punishment x Total Individuals' Loans/GSP



It is possible to estimate a confidence interval for the optimal level of debtors' punishment using the result obtained by the regression (fixed effects). With 90% of confidence, the optimal level of punishment holds between 0.192 and 0.223.

Confidence Interval: optimal level of punishment and exemption

	90%	95%
<i>debtors' punishment</i>	(0.192; 0.223)	(0.188; 0.226)
<i>bankruptcy exemption</i>	(\$24, 663; \$28, 645)	(\$24, 336; \$29, 255)

Moreover, since the bankruptcy exemption is a function of debtors' punishment, we can calculate the confidence intervals for the levels of bankruptcy exemptions that provide the maximal level of development in the individuals' credit market.

We can say with 90% of confidence that the optimal bankruptcy exemption level for an American state that maximizes total individuals' credit in the economy belongs to the interval (\$24, 663; \$28, 645). Observe that it is not optimal for the economy a punishment to be neither sufficiently harsh nor sufficiently lenient.

Table 4: OLS Regression - pooled cross-section with 306 observations

Dependent variable	PL		CCL		TIL	
constant	-10.22 <sup>a</sup> (0.76)	64.33 <sup>a</sup> (18.97)	-5.08 <sup>b</sup> (2.09)	12.26 (35.84)	-5.94 <sup>a</sup> (1.34)	11.13 (23.78)
Ef. Debtors' Punishment	0.36 <sup>a</sup> (0.07)	0.64 <sup>a</sup> (0.16)	1.17 <sup>a</sup> (0.23)	1.41 <sup>a</sup> (0.41)	0.69 <sup>a</sup> (0.13)	0.52 <sup>a</sup> (0.20)
Ef. Debtors' Punishment <sup>2</sup>	-0.09 <sup>a</sup> (0.02)	-0.12 <sup>a</sup> (0.03)	-0.27 <sup>a</sup> (0.06)	-0.49 <sup>a</sup> (0.08)	-0.17 <sup>a</sup> (0.03)	-0.17 <sup>a</sup> (0.04)
ln(GSP)	-2.04 <sup>a</sup> (0.15)	1.33 (1.12)	-1.29 <sup>a</sup> (0.42)	2.19 (2.32)	-1.99 <sup>a</sup> (0.27)	2.34 <sup>c</sup> (1.34)
ln(population)	2.03 <sup>a</sup> (0.16)	-6.14 <sup>a</sup> (2.00)	1.16 <sup>a</sup> (0.43)	-2.97 (3.64)	1.80 <sup>a</sup> (0.28)	-2.81 (2.41)
unemployment(-1)	-0.10 <sup>a</sup> (0.02)	-0.10 <sup>a</sup> (0.03)	-0.36 <sup>a</sup> (0.06)	-0.14 <sup>c</sup> (0.08)	-0.22 <sup>a</sup> (0.04)	-0.11 <sup>a</sup> (0.04)
Fixed Effects	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>
Dummies of regions	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>
R-square	0.56	0.83	0.24	0.86	0.35	0.87

Note: Standard errors and covariance robust to heteroskedasticity.

standard errors are in parentheses

a-significant at 1%, b-significant at 5%, c-significant at 10%

In 1992, only eight states in the U.S. apply a punishment to debtors that are within the optimal range, while twenty-five apply a punishment below this range and eighteen above it. Until 1997 the set of states with punishment below the optimal range increases dramatically to thirty-four, while the number states with punishment within and above the optimal range falls to two and fifteen respectively. Thus, the most significant feature is that there are several states that apply extremely low bankruptcy exemptions, giving a strong incentive to file for bankruptcy.

It is observable that between 1991 and 1998 the median net value of holdings<sup>23</sup> of an individual fluctuates within a fairly narrow range from 40,000 to 46,000 dollars<sup>24</sup>. Applying the optimal punishment (26,000) it is possible to provide both a fresh start to failed debtors - since they will still hold approximately between \$14,000 - \$20,000 dollars of their goods -

<sup>23</sup>Values in constant 1997 levels.

<sup>24</sup>See Orzechowski, S. and Sepielli, P. (2003)

and a significant recovery to lenders (6,000 dollars at least) since the median amount of debts that file for Chapter 7 bankruptcy is approximately 32,000 dollars<sup>25</sup> (approximately 19% of the debt). However, because of the higher levels of exemptions in most states – which provides a weak protection to creditors – what really happens is that debtors are motivated to file strategically for default, and creditors do not receive a significant amount of the debt (in 20 states the bankruptcy exemption is bigger than the median value of holdings).

To exemplify the effect of the optimal punishment on individuals' credit market, suppose that a state that applies a bankruptcy exemption of 200,000 dollars (like Minnesota in 1997) decides to modify its bankruptcy exemption to the optimal level (approximately 26,500). Such a change, according to the regression results, tends to produce an increase of 30% in the level of credit, raising the level of individuals' loans/GSP from 0.0975 to 0.127. Conversely, states with too low exemptions (or high debtors' punishment and creditors' protection), like Nebraska with a bankruptcy exemption of 12,500 dollars, produces an increase of almost 54% boosting the individuals' private credit from 0.10<sup>26</sup> to 0.154.

Running the same test for effective debtors' punishment, table 4 shows that the results are again highly significant, independent of the specification. For the three measures of individuals' private credit, the result of intermediary optimal level of debtors' punishment still holds, meaning that even considering the penalty as a portion of individuals' income (a real variable instead of a nominal variable) our claim is also valid.

### 2.5.2. Tests for Small Businesses' loans

Table 5 reports the results of running a OLS regressions explaining how the debtors' punishment affects small business' credit. The *SBL1* columns report the regression when the dependent variable is loans under \$100,000, the *SBL2* and *SBL3* columns report results for

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<sup>25</sup>See Barron, J. M. and Staten, M. E. (1997)

<sup>26</sup>This value refers to 1992.

loans between \$100,000 and \$250,000, and \$250,000 and \$1,000,000 respectively. Finally the *SBL* columns report the total amount of loans to small businesses.

The coefficients describing debtors' punishment are significant at the 99% level in all cases, and since the first coefficient is positive and the second is negative, the relationship has a concave form. Moreover, since the debtors' punishment varies in an interval between 0 and 1, there is an intermediary punishment that maximizes the volume of loans for small businesses. Figure 2 (*SBL* with fixed effects) that illustrates the shape of the studied relation shows the intermediary penalty that is optimal for the development of the small businesses' credit market. The intuition behind this result is the same that the individuals' case.

Table 5: OLS Regression - pooled cross-section with 306 observations

Dependent Variable	<i>SBL1</i>		<i>SBL2</i>	
constant	-8.42 <sup>a</sup> (0.64)	43.90 <sup>a</sup> (15.05)	-7.64 <sup>a</sup> (0.53)	11.60 (11.85)
Debtors' Punishment	0.91 <sup>a</sup> (0.29)	6.90 <sup>a</sup> (1.34)	0.50 <sup>a</sup> (0.19)	3.71 <sup>a</sup> (0.83)
Debtors' Punishment <sup>^2</sup>	-1.27 <sup>a</sup> (0.31)	-13.50 <sup>a</sup> (3.15)	-0.67 <sup>a</sup> (0.21)	-5.44 <sup>a</sup> (1.30)
ln(GSP)	-2.04 <sup>a</sup> (0.13)	0.32 (0.81)	-1.10 <sup>a</sup> (0.12)	-0.33 (0.73)
ln(population)	1.82 <sup>a</sup> (0.13)	-3.91 <sup>a</sup> (1.35)	1.05 <sup>a</sup> (0.12)	-1.03 (1.24)
unemployment (-1)	-0.07 <sup>a</sup> (0.02)	-0.045 (0.03)	-0.06 <sup>a</sup> (0.02)	-0.04 <sup>c</sup> (0.025)
Fixed Effect	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>
Dummies of regions	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>
R-Square	0.78	0.94	0.59	0.86

Note: Standard errors and covariance robust to heteroskedasticity.

Standart erros are in parentheses.

a-significant at 1%, b-significant at 5%, c- significant at 10%.

Table 5 (Cont.): OLS Regression - pooled cross-section with 306 observations

Dependent Variable	SBL3		SBL	
constant	-7.03 <sup>a</sup> (0.43)	11.01 (14.90)	-6.45 <sup>a</sup> (0.44)	22.57 <sup>b</sup> (11.02)
Debtors' Punishment	0.72 <sup>a</sup> (0.21)	3.87 <sup>a</sup> (1.00)	0.59 <sup>a</sup> (0.19)	4.58 <sup>a</sup> (0.88)
Debtors' Punishment <sup>2</sup>	-0.87 <sup>a</sup> (0.22)	-5.10 <sup>a</sup> (1.53)	-0.85 <sup>a</sup> (0.20)	-8.20 <sup>a</sup> (1.74)
ln(GSP)	-0.91 <sup>a</sup> (0.11)	-0.23 (0.91)	-1.34 <sup>a</sup> (0.10)	0.06 (0.68)
ln(population)	0.92 <sup>a</sup> (0.11)	-1.00 (1.54)	1.26 <sup>a</sup> (0.10)	-2.02 <sup>c</sup> (1.13)
unemployment(-1)	-0.06 <sup>a</sup> (0.02)	-0.05 <sup>c</sup> (0.03)	-0.06 <sup>a</sup> (0.01)	-0.05 <sup>b</sup> (0.02)
Fixed Effect	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>
Dummies of regions	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>
R-Square	0.50	0.75	0.68	0.88

Note: Standard errors and covariance robust to heteroskedasticity.

Standart erros are in parentheses.

a-significant at 1%, b-significant at 5%, c- significant at 10%.

Figure 2: Debtors' Punishment x Small Businesses' loans/GSP



Using the result obtained by the regressions, we estimate a confidence interval for the optimal level of debtors' punishment and for the bankruptcy exemption since it is function of debtor' punishment.

*Confidence Interval: optimal level of punishment and exemption*

	90%	95%
<i>debtors' punishment</i>	(0.273; 0.285)	(0.272; 0.286)
<i>bankruptcy exemption</i>	(\$19, 300; \$20, 146)	(\$19, 230; \$20, 220)

We can say with 90% of confidence that the optimal level of punishment and the bankruptcy exemption for an American state that maximizes the small business' credit in the economy belongs to the interval (0.273; 0.285) and (\$19, 300; \$20, 146) respectively. Again, notice that is not optimal for the economy a punishment to be neither sufficiently harsh nor sufficiently lenient.

Table 6: OLS Regression pooled cross-section with 306 observations

Dependent Variable	SBL1		SBL2	
constant	-8.34 <sup>a</sup> (0.63)	43.60 <sup>a</sup> (16.47)	-7.58 <sup>a</sup> (0.53)	11.96 (11.67)
Ef. Debtors' Punishment	0.15 <sup>a</sup> (0.05)	0.62 <sup>a</sup> (0.18)	0.074 <sup>b</sup> (0.037)	0.51 <sup>a</sup> (0.12)
Ef. Debtors' Punishment <sup>2</sup>	-0.05 <sup>a</sup> (0.01)	-0.12 <sup>a</sup> (0.03)	-0.022 <sup>b</sup> (0.008)	-0.08 <sup>a</sup> (0.02)
ln(GSP)	-2.04 <sup>a</sup> (0.13)	0.70 (0.88)	-1.10 <sup>a</sup> (0.11)	-0.26 (0.73)
ln(population)	1.82 <sup>a</sup> (0.13)	-4.14 <sup>a</sup> (1.36)	1.04 <sup>a</sup> (0.12)	-1.09 (1.21)
unemployment(-1)	-0.07 <sup>a</sup> (0.02)	-0.03 (0.03)	-0.06 <sup>a</sup> (0.02)	-0.03 (0.02)
Fixed Effect	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>
Dummies of regions	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>
R-Square	0.73	0.93	0.59	0.86

Note: Standard errors and covariance robust to heteroskedasticity.

t-statistics are in parentheses

a-significant at 1%, b-significant at 5%, c- significant at 10%



Table 6 (Cont. ): OLS Regression pooled cross-section with 306 observations

Dependent Variable	SBL3		SBL	
constant	-7.01 <sup>a</sup> (0.44)	11.26 (14.57)	-6.40 <sup>a</sup> (0.45)	22.65 <sup>b</sup> (11.36)
Ef. Debtors' Punishment	0.13 <sup>a</sup> (0.03)	0.57 <sup>a</sup> (0.14)	0.093 <sup>b</sup> (0.039)	0.48 <sup>a</sup> (0.12)
Ef. Debtors' Punishment <sup>2</sup>	-0.035 <sup>a</sup> (0.01)	-0.08 <sup>a</sup> (0.03)	-0.03 <sup>a</sup> (0.008)	-0.076 <sup>a</sup> (0.02)
ln(GSP)	-0.92 <sup>a</sup> (0.11)	-0.20 (0.90)	-1.35 <sup>a</sup> (0.10)	0.26 (0.70)
ln(population)	0.94 <sup>a</sup> (0.11)	-1.04 (1.51)	1.26 <sup>a</sup> (0.11)	-2.16 <sup>c</sup> (1.11)
unemployment(-1)	-0.06 <sup>a</sup> (0.01)	-0.05 <sup>c</sup> (0.03)	-0.06 <sup>a</sup> (0.01)	-0.04 <sup>c</sup> (0.022)
Fixed Effect	<b>No</b>	<b>Yes</b>	<b>No</b>	<b>Yes</b>
Dummies of regions	<b>Yes</b>	<b>No</b>	<b>Yes</b>	<b>No</b>
R-Square	0.49	0.74	0.65	0.88

Note: Standard errors and covariance robust to heteroskedasticity.

t-statistics are in parentheses

a-significant at 1%, b-significant at 5%, c- significant at 10%

Considering the confidence interval of the optimal punishment for the period 1992 to 1997, only one state in U.S. apply a punishment that belongs to the optimal range, while more than two-third (thirty-six in 1992 and thirty-seven in 1997) of the states apply punishments below this range. This feature means that the 1978 Bankruptcy Reform worked to push the debtors' punishment to extremely low and inefficient levels in most states, allowing them to keep a significant share of their wealth. It contributes to worsen the credit market conditions in several states since the protection of creditors interests in case of bankruptcy is very low.

To exemplify the effect of the optimal debtors' punishment on small business' loans, suppose that a state that apply a bankruptcy exemption of 200,000 dollars (like Minnesota in 1997) decide to modify its bankruptcy exemption to the optimal level (approximately 20,000), increasing the creditors' protection. Such change, according to the regression results, tends to produce an increase of 68% in the amount of loans (loans below \$100,000 increases 101%).

On the other side (higher levels of punishment), if Nebraska decide to modify its exemption raising it from \$12,500 to \$20,000, reducing the creditors' protection, the total amount of loans increases 24%, with the biggest push coming from the loans below \$100,000 that raises approximately 58%.

Running the same test for effective debtors' punishment, table 6 shows that results are again significant in most classes of loans (the exception is *SBL3* with fixed effect). For all classes the result of intermediary optimal level of debtors' punishment still holds, which means that even considering the penalty as a portion of individuals' income (a real variable instead of a nominal variable) our claim is also valid.

## 2.6. Conclusion

The objective of this paper was to challenge the conventional wisdom of the empirical findings about the "power" theories of credit. Pioneering, La Porta et al. (1997) and latter Djankov et al. (2006) stress that creditor protection through the legal system is associated with a broader credit market in a monotone way, or simply the higher the protection to creditors the better is to the credit market. In this paper we try to answer if such findings still holds when the creditors' protection is directly determined by the debtors' punishment.

To analyze this issue, we started with a simple model that provides some predictions about the behavior of the demand and supply of credit. On the supply side, the model predicts that as the debtors' punishment (or creditors' protection) diminishes, the interest rates charged to borrowers increase, and when it is sufficiently low the supply of credit disappears. This is explained by the lower expected repayment and the higher possibilities of strategic bankruptcy. On the demand side, the fear of a extremely harsh punishment in bankruptcy states makes debtors to avoid borrowing, reducing their demand for credit. As the debtors' punishment decreases the demand for credit is motivated due to the option provided by the legal system to debtors tailor another asset, aligned with their personal interests, to substitute the original debt contract at a cost of the bankruptcy punishment. To analyze

the equilibrium we simulate the model to different levels of punishments. The results show that both extreme levels of punishments (high and low) provide an underdevelopment in the credit market. Thus, there is an intermediate level of punishment that maximizes the level of credit and welfare in the economy. Therefore, the equilibrium of the volume of credit is a non-monotonic function of the debtors' punishment levels (or creditors' protection levels).

After the theoretical approach, we aimed at verifying empirically the effect of a punishment on individuals and small businesses' private credit market. Unlike the current literature, we address this question comparing states in the U.S., taking advantage of changes provided by the Personal Bankruptcy Reform Act of 1978 that redefined the degree of penalty to debtors in case of bankruptcy. As expected, the conventional conclusion from La Porta et al. (1997) and Djankov et al. (2006) doesn't hold any more. We find a non-monotonic relationship between debtors' punishment and the small businesses and individuals' private credit market development. It means that low levels creditors' protection are too lenient with debtors, providing incentive for bankruptcy which produces a negative effect on the supply of credit, since lenders expect to receive less in these states. On the other hand too high levels of creditors' protection provide to debtors a harsh punishment in case of bankruptcy, inhibiting their demand for credit, fearing bad states of nature. Therefore, the optimal punishment is the one that allows a fresh re-start for debtors and a significative recovery for lenders in case of bankruptcy.

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## 2.7. Appendix

**Proof of Proposition 1.** Let

$(1 + r_f)B = p(C1)(1 + r)B + \sum_s p_s [\iota_s \iota_d + (1 - \iota_s)] [\max(w_{2s} + \delta D - E, 0) - \gamma B]$  be the function that determines the supply of credit. Let  $E^*$  be equal  $w_{2S} + \delta D$ . Thus, for every  $E$  above  $E^*$  the borrowers will file for bankruptcy in every state of nature since  $\iota_d = 1$  for all  $s$ , making  $p_{bankruptcy} = \sum_{s=1}^S p_s = 1$ . Also,  $\max(w_{2s} + \delta D - E, 0) = 0$ , making the supply function  $(1 + r_f)B = -\gamma B$ . The only value of  $B$  that satisfies this expression is  $B = 0$ .  $\square$

**Proof of Proposition 2.** Let

$$(1 + r_f)B = p(C1)(1 + r)B + \sum_s p_s [\iota_s \iota_d + (1 - \iota_s)] [\max(w_{2s} + \delta D - E, 0) - \gamma B]$$

Suppose that the bankruptcy exemption  $E$  decreases. Thus,  $w_{2s} + \delta D - E$  will increase as well as the probability of solvency since there will be more states of nature that  $(1 + r)B \leq \max(w_{2s} + \delta D - E, 0)$ . Both forces work to increase the expected return of lenders. To hold

the equality of the supply function it is necessary to reduce  $r$ . □

**Proof of Proposition 3.** To prove it by contradiction let us suppose that if  $E$  increases to  $E'$ ,  $B$  decreases. This condition means that  $u'_E(c_1) < u'_{E'}(c_1)$ , because  $w_1 + D + B > w_1 + D + B'$ .

By the individuals' maximization problem, if  $u'_E(c_1) < u'_{E'}(c_1)$  holds, we have  $\sum_{s=h}^S p_s u'_E(c_{2s}) < \sum_{s=i}^S p_s u'_{E'}(c_{2s})$ , where  $h$  and  $i$  are the worst states of nature that the agent chooses not file for default for  $E$  and  $E'$  respectively.

But if  $B > B'$ , the marginal utility at the second period for  $E$  is bigger than for  $E'$  – that is  $u'_E(c_{2s}) > u'_{E'}(c_{2s})$  – because  $w_{2s} + \delta D - (1 + r)B < w_{2s} + \delta D - (1 + r)B'$ . Also, since  $E'$  is bigger, the states of nature that the agents file for default increase (or at least remain the same), thus  $i \geq h$  meaning that the debtors pay their debts in less states ( $S - h \geq S - i$ ).

Hence,  $u'_E(c_{2s}) > u'_{E'}(c_{2s})$  and  $i \geq h \Rightarrow \sum_{s=h}^S p_s u'_E(c_{2s}) > \sum_{s=i}^S p_s u'_{E'}(c_{2s})$ , what is a contradiction. Therefore, if  $E$  increases  $B$  increases too.

Moreover, if  $E \rightarrow \infty$  the marginal cost of the debt is zero ( $u'_{E'}(c_1) = 0$ ) since  $\min[(1 + r)B, \max(w_{2s} + \delta D - E, 0)] = 0$ . Thus,  $c_1 \rightarrow \infty$  and since  $w_1 + D$  are constant  $B \rightarrow \infty$ .

Therefore, an increase in the bankruptcy exemption makes the demand for credit increase. □

**Proof of Proposition 4.** Let

$(1 + r_f)B = p(C1)(1 + r)B + \sum_s p_s [\iota_s \iota_d + (1 - \iota_s)] [\max(w_s B^\alpha + D - E, 0) - \gamma B]$  be the function that determines the supply of credit. Let  $E^*$  be equal  $w_s B^\alpha + D$ . Thus, for every  $E$

above  $E^*$  the entrepreneurs will file for bankruptcy in every state of nature since  $\iota_d = 1$  for all  $s$ , making  $p_{bankruptcy} = \sum_{s=1}^S p_s = 1$ . Also,  $\max(w_s B^\alpha + D - E, 0) = 0$ , making the supply function  $(1 + r_f)B = -\gamma B$ . The only value of  $B$  that satisfies this expression is  $B = 0$ .  $\square$

**Proof of Proposition 5.** Let

$$(1 + r_f)B = p(C1)(1 + r)B + \sum_s p_s [\iota_s \iota_d + (1 - \iota_s)] [\max(w_s B^\alpha + D - E, 0) - \gamma B]$$

Suppose that the bankruptcy exemption  $E$  decreases. Thus,  $w_s B^\alpha + D - E$  will increase as well as the probability of solvency since there will be more states of nature that  $(1 + r)B \leq \max(w_s B^\alpha + D - E, 0)$ . Both forces work to increase the expected return of lenders. To hold

the equality of the supply function it is necessary to reduce  $r$ .  $\square$

**Proof of Proposition 6.** Let  $E = 0$ . The constraint (2.3) that represents the entrepreneur consumption is:

$$c_s = w_s B^\alpha + D - \min[(1 + r)B, w_s B^\alpha + D] \quad \forall s$$

$$\text{since } w_s B^\alpha + D > 0 \quad \forall s.$$

Then, if  $w_s B^\alpha + D - (1 + r)B > 0$  we have  $c_s = w_s B^\alpha + D - (1 + r)B$ , otherwise if  $w_s B^\alpha + D - (1 + r)B \leq 0$  we have  $c_s = 0$ .

Therefore the entrepreneur's problem when  $E = 0$  is:

$$\max_B p_S u(w_S B^\alpha + D - (1 + r)B) + \dots + p_i u(w_i B^\alpha + D - (1 + r)B) + 0 + \dots + 0$$

where  $w_i$  is such that  $w_i B^\alpha + D - (1 + r)B > 0$  and  $w_{i-1} B^\alpha + D - (1 + r)B < 0$ .

Maximizing in  $B$  we have:

$$B^0 = \left( \frac{\alpha \sum_{s=i}^S p_s u'(c_s) w_s}{r \sum_{s=i}^S p_s u'(c_s)} \right)^{\frac{1}{1-\alpha}}$$

Now suppose  $E' = E + \varepsilon = \varepsilon$ , for  $\varepsilon > 0$  and sufficiently small such that it keeps the inflexion point in consumption in  $w_i$ . Now, when  $w_s B^\alpha + D - (1+r)B \leq 0$  holds, instead the borrowers consume zero, their consumption is  $E'$  for states when  $w_s B^\alpha + D > E'$  and  $w_s B^\alpha + D$  when  $w_s B^\alpha + D < E'$ .

The entrepreneur's problem is:

$$\begin{aligned} \max_l p_S u(w_S B^\alpha + D - (1+r)B) + \dots + p_i u(w_i B^\alpha + D - (1+r)B) + \\ + p_{i-1} u(E') + \dots + p_j u(E') + p_k u(w_k B^\alpha + D) + \dots + p_1 u(w_1 B^\alpha + D) \end{aligned}$$

where  $w_i$  is such that  $w_i B^\alpha + D - (1+r)B > E'$  and  $w_{i-1} B^\alpha + D - (1+r)B < E'$  with  $w_{i-1} B^\alpha + D \geq E'$ , and also  $w_k$  is such that  $w B^\alpha + D < E'$ .

Maximizing in  $B$  we have:

$$\begin{aligned} B' &= \left( \frac{\alpha \left( \sum_{s=i}^S p_s u'(c_s) w_s + \sum_{s=1}^k p_s u'(c_s) w_s \right)}{r \sum_{s=i}^S p_s u'(c_s)} \right)^{\frac{1}{1-\alpha}} \\ B' &= \left( \frac{\alpha \sum_{s=i}^S p_s u'(c_s) w_s}{r \sum_{s=i}^S p_s u'(c_s)} + \frac{\alpha \sum_{s=1}^k p_s u'(c_s) w_s}{r \sum_{s=i}^S p_s u'(c_s)} \right)^{\frac{1}{1-\alpha}} \\ B' &= B^0 + \left( \frac{\alpha \sum_{s=1}^k p_s u'(c_s) w_s}{r \sum_{s=i}^S p_s u'(c_s)} \right)^{\frac{1}{1-\alpha}} \end{aligned}$$

Therefore  $B' > B^0$ . □



State	Homestead	Personal Property	Wild Card	Federal Exemptions Allowed?
Alabama	5,000*	3,000	3,000	no
Alaska	54,000	3,000	0	no
Arizona	100,000	1,650*	0	no
Arkansas	unlimited	1,700	500*	yes
California	75,000	5,000	400*	no
Colorado	30,000*	1,000	0	no
Connecticut	0	1,500	400	yes
Delaware	5,000*	0	500	no
District of Columbia	0	500	0	yes
Florida	unlimited	1,000	1,000*	no
Georgia	5,000*	1,400	400	no
Hawaii	20,000	1,000	0	no
Idaho	50,000	1,500	800	no
Illinois	7,500*	3,200	2000	no
Indiana	7,500*	4,100	4,000*	no
Iowa	unlimited	5,100	100	no
Kansas	unlimited	20,000	0	no
Kentucky	5,000	3,500	1,000	no
Louisiana	15,000	20,000	0	no
Maine	7,500*	6,100	400	no
Maryland	0	0	5,500	no
Massachusetts	100,000	1,675	0	yes
Michigan	3,500	1,000	0	yes
Minnesota	unlimited	3,000	0	yes
Mississippi	75,000	10,000	10,000	no
Missouri	8,000	1,750	1,250	no
Montana	40,000	1,200	0	no
Nebraska	10,000	0	0	no
Nevada	95,000	6,000	0	no
New Hampshire	30,000	1,000	0	no
New Jersey	0	0	0	yes
New Mexico	20,000*	4,500	500	yes
New York	10,000*	4,900	0	no
North Carolina	10,000*	5,000	0	no
North Dakota	80,000	6,200	0	no
Ohio	5,000	2,200	400	no
Oklahoma	unlimited	0	0	no
Oregon	15,000	8,700	400*	no
Pennsylvania	0	0	300	yes
Rhode Island	0	0	0	yes
South Carolina	5,000*	1,200	0	yes
South Dakota	30,000*	4,000	2000*	no
Tennessee	7,500	4,000	4000	no
Texas	unlimited	0	0	yes
Utah	8,000	1,500	0	no
Vermont	30,000*	10,600	7400	yes
Virginia	5,000*	2,000	0	no
Washington	30,000	2,600	2000	yes
West Virginia	7,500*	1,600	800	no
Wisconsin	40,000	2,200	0	yes
Wyoming	10,000*	2,000	0	no
Federal	7,500*	5,350*		

\*Indicates that the exemption doubles (or raised) for married couples.

<i>Cont.</i>	
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Changes in 1993	State
Homestead Exemptions	Connecticut: from 7,500 to 75,000 New México: from 20,000 to 30,000 Oregon: from 15,000 to 25,000
Personal Property exemptions	Minnesota: from 3,000 to 3,200 Missouri: from 1,750 to 2,250 Oregon: from 8,700 to 9,200
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Changes in 1994	State
Homestead Exemptions	All States with federal exemptions from 7,500 to 15,000
Personal Property exemptions	from 5,350 to 10,700
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Changes in 1995	State
Homestead Exemptions	Maine: from 7,500 to 12,500 Vermont: from 30,000 to 75,000
Personal Property exemptions	Maine: from 6,100 to 7,400
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Changes in 1996	State
Homestead Exemptions	Minnesota: from unlimited to 200,000
Personal Property exemptions	California: from 2,500 to 5,000
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Changes in 1997	State
Homestead Exemptions	Montana: from 40,000 to 60,000 Nebraska: from 10,000 to 12,500 Nevada: from 95,000 to 125,000 Utah: from 8,000 to 10,000 West Virginia: from 7,500 to 15,000
Personal Property exemptions	Nevada: from 6,000 to 9,000 Utah: from 1,500 to 2,500 West Virginia: from 1,600 to 3,200 Wyoming: from ,2000 to 2,400
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## CHAPTER 3

# Bankruptcy Law in Latin America: Past and Future<sup>1</sup>

### Abstract

This paper studies bankruptcy law in Latin America, focusing on the Brazilian reform. We start with a review of the international literature on this subject. Next we examine the economic incentives associated with several aspects of bankruptcy laws and insolvency procedures in general, as well as the trade-offs involved. We follow this theoretical discussion with an empirical evaluation of the quality of current insolvency procedures in Latin America. We find that the region is governed by a set of laws that is inefficient even when compared with regions of lower per capita income. This inefficiency has severe consequences for credit markets and the cost of capital. Next we focus on the recent Brazilian bankruptcy reform, analyzing its main components and possible effects. The appendix describes difficulties of the reform process in Brazil and lessons other Latin American countries can learn from it.

### 3.1. Introduction

Modern economic theory increasingly recognizes the relevance of legal and institutional structures for the functioning and development of the economy. Bankruptcy laws are a crucial element of such institutions. This paper examines the laws that govern corporate bankruptcy procedures, their effects on the economic environment, and the recent bankruptcy reforms in Latin America, with a focus on Brazil.

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Firms take on debts for several reasons. They generally intend to repay these debts with their future gains, but there is always the possibility that the borrowing firms will not fulfill the repayment promise. Bankruptcy law determines what happens in such circumstances.

In the absence of a bankruptcy law, creditors have two legal procedures at their disposal. In the case of secured loans, creditors can seize the firm's assets that serve as collateral for their loans. In the case of unsecured loans, creditors can go to court asking to sell some of the firm's assets. This method of debt collection runs into difficulties when there are many creditors and the debtor's assets do not cover its liabilities (that is, when the firm is insolvent). Under these conditions, each creditor will try to be the first to recover its debts. This uncoordinated race of creditors may lead to the dismantling of the firm's assets and a loss of value for all creditors.

It is in the collective interest of creditors, and of society at large, that the disposition of the debtor's assets be carried out in an orderly way, via a centralized bankruptcy procedure. In a perfect world, there would be no need for a bankruptcy law because individuals could solve this problem through private contracts in which the debtor specified *ex ante* what would happen in case of default (for example, how to divide up assets and use them for debt repayment). Writing such contracts is very difficult, however. Debtors may acquire new creditors and assets after the contract is signed, and it is hard to specify how the division process should change as a function of such adjustments. Besides, contracts like this simply are not written in practice. Bankruptcy law provides a default option for this problem of contract incompleteness.

Most countries have two bankruptcy procedures: one for liquidating the assets of failing firms and another for reorganizing failing firms. Ideally, bankruptcy law should provide a good balance between liquidation and reorganization procedures.

When a firm files for bankruptcy liquidation, the bankruptcy court appoints a trustee who shuts down the firm and sells its assets. This can involve either the sale of the whole business or its productive units or the piecemeal sale of its assets, depending on demand

and on which option maximizes the value of the company's assets. The absolute priority rule determines how the proceeds of sale are divided among the claimants. It specifies what claims are paid in full according to an order defined by bankruptcy law of each country.

Reorganization is the other alternative. When capital markets are imperfect, which is very common in developing countries, the best managers may not be able to raise the necessary cash to buy the firm. The firm may therefore be inefficiently dismantled and its assets sold cheaply. Reorganization provides a good alternative for countries with weak capital markets. Another explanation for the loss of value in liquidation is that when a firm in financial distress needs to sell its assets, its industry peers are likely to be experiencing problems themselves, forcing the trustee to sell the assets below their potential value.<sup>2</sup> Hence, if assets are very firm-specific and the correlation of returns across firms is high, reorganization is likely to be preferable to liquidation as way to maximize firm value after insolvency.

Reorganization is particularly appropriate for firms that are financially distressed but not economically inefficient.<sup>3</sup> There are different approaches to choosing between reorganization and liquidation. Some countries (like Germany, France, and England) give the exclusive control of the proceeding to an outside official, who makes the initial decision of whether to liquidate the firm or to keep it operating while a reorganization plan is formulated. Other countries (like Argentina and Chile) assign an impartial and independent administrator to supervise the manager; the administrator assumes complete power if management proves incompetent or negligent or has engaged in fraud or misbehavior. Finally, a number of countries (including the United States) give managers the right to choose between filing for bankruptcy liquidation or reorganization. Managers have the exclusive right to propose a reorganization plan.

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<sup>2</sup>See Shleifer and Vishny (1992).

<sup>3</sup>A firm is financially distressed or insolvent when it can no longer meet its debt obligations with another firm or institution. It is economically efficient if the best use of its capital is the current use, and it is economically inefficient if the value of its assets is greater in some other use.

Choosing reorganization over liquidation produces a conflict between the secured creditors' right to claim their collateral and the goal of reorganizing the firm. To be successful, the firm must retain assets, which are crucial to its operations. At the same time, secured creditors often wish to claim these assets. Some countries, such as the United States, resolve this conflict in the firm's favor by applying an automatic stay to secured creditors, thereby making the reorganization process more appealing. Not all countries have this degree of protection, and some (including Germany and the United Kingdom) do not have it at all. This weakens or even eliminates the possibility of reorganization.

Well-designed bankruptcy procedures can influence the establishment of a healthy business environment in a number of ways. From an ex post efficiency perspective, a bankruptcy law should maximize the total value of the company and, consequently, the payoff that creditors receive from insolvent firms. This reduces the cost of capital, since creditors have a high expectation of recovery in case of bankruptcy. Ex ante efficiency is also important. From this perspective, what matters is not the total value of the failed firm, but the division of its value among the participants. An ex ante efficient bankruptcy law is capable of producing the right incentives for managers' decisions, both in the initial period of a firm's life and after the firm goes into financial distress. Bankruptcy procedures should penalize managers adequately: without any potential adverse consequences, they have very little incentive to work hard in the early stages to pay the firm's debts. If well designed, these incentives should reduce the chances of any firm going bankrupt. In the post-insolvency period, management tends to make two inefficient bankruptcy decisions: undertaking excessively risky investments as a means of avoiding bankruptcy and delaying filing for bankruptcy to extract the maximum pecuniary gains possible. A good insolvency system reserves some portion of value in bankruptcy for managers and shareholders, which motivates actions in favor of efficient investment and timely decisions.

All the mechanisms cited above contribute to increasing the expected return for creditors, whether by raising the return in bankruptcy states or diminishing the probability of bankruptcy. Both effects work to reduce the cost of capital in the economy. Low capital costs, in particular, are fundamental for reaching an *ex ante* objective of bankruptcy law—namely, to maximize the set of projects creditors want to finance.

Another relevant function of bankruptcy law is to prevent fraud. Fraudulent actions have an important role in bankruptcy processes, especially in Latin America. Mechanisms that expand the role of creditors (such as active participation in reorganization) and increase the expected return in bankruptcy serve at the same time to raise creditors' incentives to monitor the bankruptcy procedure, making fraudulent actions more difficult.

This paper analyzes bankruptcy law in Latin America, focusing on the 2005 Brazilian bankruptcy reform. One central conclusion is that in Latin America and the Caribbean, most countries have a very inefficient bankruptcy procedures. Bankruptcy law typically provides little creditor protection. This in turn results in weak credit markets, a high cost of capital, and low creditors' recovery rate.

Brazil, in particular, has a history of inefficient bankruptcy institutions. As shown in table 1, Brazilian bankruptcy law compares poorly with that of the average Latin American country on both crucial variables. The good news is that an extensive reform was passed in June 2005. It is expected to have an important impact on the business environment.

**Table1. Bankruptcy Law Indicators**

<i>Country or region</i>	<i>Creditors' protection [0,1]</i>	<i>Goals of insolvency [0,100]</i>
Brazil	0.06	24.0
Latin America and the Caribbean	0.19	46.3
OECD	0.46	79.6

Source: World Bank, *Doing Business* (2003).

The paper is structured as follows. The next section describes the evolution of the literature on bankruptcy theory and examines the direct and indirect economic consequences of a successful bankruptcy reform. The following section opens with a simple model that

captures economic effects and trade-offs involved in bankruptcy law, showing how changes in the system could affect a firm's investment, effort, and other choices.

We then use this framework to analyze bankruptcy law in Latin America and the Caribbean. Using data from the World Bank and the International Monetary Fund (IMF), we compare bankruptcy procedures across groups of countries, and test empirically the effects of the quality of bankruptcy law.<sup>4</sup> The next-to-last section discusses the recent Brazilian bankruptcy reform, emphasizing the main changes and potential effects on the economy. The final section presents concluding remarks, exploring policy lessons that other Latin American countries should consider when they reform their bankruptcy laws.

### 3.2. Review of the Literature

Modern bankruptcy theory begins with the recognition of the collective action problem among creditors of an insolvent firm. Jackson, for example, stresses this common pool problem.<sup>5</sup> He argues that despite the objective of maximizing the value of the failing firms' assets, creditors tend to act in their own self-interest, which opens the door to an uncoordinated debt collection that can prove very costly in terms of the value of the firm. If unsecured creditors perceive that a firm is insolvent, they anticipate that it will not be able to repay all its creditors in full, setting off a race to be first to collect from the firm. When the liquidation is not coordinated, the assets are sold piecemeal and the firm's operations are disrupted. The firm then will probably be forced to shut down even when the best use of its assets is continued operation.<sup>6</sup> This causes social welfare losses, and the firm's value is not maximized. Moreover, such conflict delays the liquidation resolution, which leads to additional losses in the firm's value. A bankruptcy system can prevent this inefficient equilibrium by staying the creditors' collection effort until a state official can decide whether the firm is worth saving.

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<sup>4</sup>World Bank, *Doing Business* (2003, 2004) and *World Development Indicators* (2004); IMF, *International Financial Statistics* (2004).

<sup>5</sup>Jackson (1986).

<sup>6</sup>Webb (1991) shows that this is a classical case of prisoner's dilemma.



The ensuing debate attempted to specify how a bankruptcy law should work. The early economists focused on avoiding deviations from the absolute priority rule (APR), as well as cutting the costs associated with bargaining in the reorganization procedure called Chapter 11 of the U.S. bankruptcy code. The role of the APR is to determine how a failing firm's value is divided. It specifies that claims are paid in full in the following order: first, administrative expenses of the bankruptcy process; second, claims taking statutory priority, such as tax claims, rent claims, and unpaid wages and benefits; and third, unsecured creditors' claims, including those of trade creditors. Equity holders receive the remainder, if any. Secured creditors are usually outside the priority ordering because they have bargained with the firm for the right to claim a particular asset or its value if the firm files for bankruptcy.<sup>7</sup> They may thus receive a payoff in bankruptcy even when all other creditors receive nothing. This rule is easily followed in a liquidation procedure because the cash received is simply distributed among claimants according to the priority of their claims as defined by bankruptcy law. In reorganization, however, the sale of the company's assets is fictional, so no verifiable objective figure is available for the total value to be distributed (like the cash in liquidation). In this situation, a conflict of interest among participants emerges. Senior creditors have an incentive to advance a low valuation of the firm's assets, because a low valuation would entitle them to a larger share of the reorganized company. Managers and equity holders have a similar incentive to advance a high valuation. Reorganization procedures that choose firms' restructuring plan using a bargaining process between interested parties – such as Chapter 11 – allow deviations from the order specified by bankruptcy law. APR violations mean that equity holders, who always have bottom priority, get some amount of the firm's value even when secured creditors' claims are not paid in full.

Bankruptcy laws that do not offer insolvent firms a reorganization procedure like Chapter 11 rule out the possibility of APR deviations. This is valuable because the priority of creditors

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<sup>7</sup>Bankruptcy law of some countries does not maintain this top priority, putting labor or tax or another claim above the claims of secured creditors (see table A1 in the appendix).

is maintained, guaranteeing greater returns once the firm files for bankruptcy. Moreover, the nonviolation of APR offers the correct incentive to managers' effort, minimizing problems of moral hazard and thus raising the possibility of firms' success. On the other hand, APR violations are possible under bankruptcy laws that provide the possibility of reorganization like Chapter 11. Despite its negative effect in the level of effort chosen by managers, such violation inhibits investments in inefficient risky projects when the firm is in financial distress, encourages desirable investment in a firm's specific input, and facilitates the transference of information to creditors, thereby improving the timing of filing for bankruptcy. Such benefits tend to increase the firms' return in both bankruptcy and nonbankruptcy states. This higher return in bankruptcy states may sometimes offset creditors' direct losses of such violation (that is, the part of the value that is given to managers and shareholders in bankruptcy), and thus lower the cost of capital.

Some early economic theorists favored a market auction approach to cutting the costs implicit in reorganization.<sup>8</sup> Specifically, a state official would auction insolvent firms to the market, free of current claims, and then distribute the proceeds to creditors according to absolute priority rules. If economic value would be maximized by a piecemeal liquidation, the highest bids would be for individual assets; if continuing the firm as an economic entity would maximize value, then the highest bids would be for the firm as a unit.

Bebchuk argues that reorganization can capture a greater value than liquidation, especially when the company's assets are worth much more as a going concern than if sold piecemeal and if there are few or no buyers with both accurate information about the company and sufficient resources to acquire it.<sup>9</sup> He therefore proposes an options approach that homogenizes the interests of the holders and follows the absolute priority rule, creating a reorganization procedure without the burden of APR violations or bargaining costs. Under this approach, all participants in the reorganization receive certain options with respect to

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<sup>8</sup>For example, Baird (1986); Jensen (1991).

<sup>9</sup>Bebchuk (1988).

the new equities of the reorganized company. The division of value results from the participants' own decisions concerning the exercise of the options given to them. The options should be designed so that, whatever the reorganized value of the firm, no participants can complain that they would end up with less than the value to which they are entitled. This approach would improve the efficiency of asset allocation.

Bebchuk's idea receives significant support in subsequent literature. For example, Aghion, Hart, and Moore use it as the basis for a bankruptcy reform proposal that includes an auction mechanism, and Hart and others adapt it to develop a new procedure using multiple auctions.<sup>10</sup> These procedures also generated their share of critical or skeptical reactions. The criticism emphasizes that the lack of liquidity (since the firms are in financial distress) makes it impossible for shareholders to exercise their options; and the skepticism centers on the complexity of the mechanisms, which makes it difficult to implement the proposals of Aghion, Hart, and Moore and Hart and others.

Early theorists thus held that bankruptcy systems should follow absolute priority strictly. This requires creditors to be repaid in the order that the firms' contracts determine. The rule implies that equity holders should receive nothing, because the residual claim on an insolvent firm is worth nothing.

Modern theory relates the results of a bankruptcy procedure to the early stages in the life of the borrowing firm. An *ex post* efficient bankruptcy system maximizes the payoff that creditors receive from insolvent firms. In the borrowing stage, a competitive credit market would reduce the amounts that lenders can require solvent firms to repay when the lenders' expected insolvency payoffs increase. Thus, interest rates fall as the efficiency of the applicable bankruptcy system increases. In contrast, the *ex ante* efficiency of the bankruptcy system is related to the optimal division of the firm's total value. This point of research is the main target of the current discussion.

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<sup>10</sup>Aghion, Hart, and Moore (1992); Hart and others (1997).

Substantial research addresses the issue of violations of the absolute priority rule (APR), arguing that the ex ante effect of deviations from the rule are actually beneficial. In particular, this line of research shows that APR deviations encourage desirable ex ante investments in firm-specific human capital; that they facilitate the transfer of information to creditors and improve the timing of decisions to file for bankruptcy, to liquidate, or to recapitalize; and that they discourage excessive risk-taking by financially distressed firms.<sup>11</sup> Bebchuk shows that ex post APR deviations also have negative effects on ex ante decisions made by shareholders.<sup>12</sup> He argues that such deviations have an adverse effect on ex ante management decisions made prior to the onset of financial distress. The presence of APR deviations aggravates the moral hazard problem, but the final effect of such deviations is inconclusive.

The direct and indirect consequences of improving bankruptcy laws are also being investigated in the macroeconomic field. The first direct macroeconomic implication is that reducing the cost of debt capital will reduce the cost of capital generally. The equity holders retain a call option on a levered firm because shareholders can buy the firm by repaying the debt. The strike price for exercising the equity option is therefore the firm's cost of credit. Reducing this cost — that is, lowering the strike price — makes stock more valuable to own. It thus becomes easier for firms to raise equity capital as their country's bankruptcy system becomes more efficient.

The second direct implication of reducing the cost of capital by improving the bankruptcy system is the expansion of the credit market (or a reduction on the credit constraint). La Porta and others present an important empirical study on legal systems and their influence on finance, in which they show that a bankruptcy law and an enforcement mechanism that protect the rights of creditors tend to boost financial development.<sup>13</sup> We examine this relation in a previous paper, arguing that when the protection of creditors implies the penalization of

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<sup>11</sup>Berkovitch, Israel, and Zender (1997); Povel (1999); Berkovitch and Israel (1999); Eberhart and Senbet (1993).

<sup>12</sup>Bebchuk (2002).

<sup>13</sup>La Porta and others (1997).

debtors, an extremely high level of protection reduces debtors' interest in demanding credit, as they fear the possible consequences.<sup>14</sup> The supply of credit is increasing in creditors' protection because of the moral hazard problem, whereas the demand for credit is decreasing in creditors' protection because of the fear of punishment. An intermediary level of creditor protection that is neither too strong nor too weak provides the maximal level of credit in the economy.

This relationship is a first-order consequence of bankruptcy law. The most important effects of improving the law are second-order and stem from financial development. They are two-fold: namely, the impact of financial development on growth and the impact on income distribution and poverty. King and Levine study the impact on growth empirically in a sample of seventy-seven countries over the period 1960–89, using different measures of financial development and growth indicators.<sup>15</sup> Their results indicate a strong, positive relationship between each financial development measure and growth indicator.

King and Levine do not formally address the issue of causality, however. It may be the case that financial markets develop in anticipation of future economic activity. To solve the problem of possible simultaneity bias, Levine, Loayza, and Beck analyze seventy-one countries using two different econometric techniques: generalized method of moments (GMM) dynamic panel estimators and a cross-sectional instrumental variables estimator.<sup>16</sup> Their results indicate a very strong connection between the exogenous component of financial development and economic growth. These results indicate that the strong link between financial development and growth is not due to simultaneity bias.

With regard to the relationship between financial development and both income distribution and poverty alleviation, the theory provides conflicting predictions. Some theorists claim that developing the system of financial intermediaries makes financial services available

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<sup>14</sup>Araujo and Funchal (2004). This is valid only if markets are incomplete. When markets are complete, debtors can promise to repay only in cases of success.

<sup>15</sup>King and Levine (1993).

<sup>16</sup>Levine, Loayza, and Beck (2000); they use legal origin measures from La Porta and others (1998) as instrumental variables.

to a larger portion of the population, rather than restricting capital to selective groups. By ameliorating credit constraint, financial development may foster entrepreneurship, the formation of new firms, and economic growth. Others argue, however, that the rich and politically connected primarily benefit from improvements to the financial system. At early stages of economic development, access to financial services, especially credit, is limited to wealthy, well-connected individuals. The issue of whether financial development will narrow or widen income disparities even while it boosts economic growth thus remains open to debate.

Another group of theorists analyzes the relationship between financial development and income distribution as a nonlinear form. Greenwood and Jovanovic show that the interaction of financial intermediary development and income inequalities can give rise to an inverted U-shaped curve.<sup>17</sup> At early stages of financial development, only a few relatively wealthy individuals have access to the financial market and, hence, to the projects yielding the highest returns. As aggregate economic growth is generated, more people can afford to join the financial system, with positive effects on economic growth. The distributed effect of financial deepening is thus adverse to the poor in the early stages, but positive after the turning point.

Using cross-country regressions, Beck, Demirgüç-Kunt, and Levine examine whether the level of financial intermediary development influences the growth rate of Gini coefficients of income inequality, the growth rate of the income of the poorest quintile of society, and the fraction of the population living in poverty.<sup>18</sup> Their results indicate that finance exerts a disproportionately large and positive impact on the poor and thus reduces income inequality.

### **3.3. Bankruptcy Law: Economic Issues and Trade-offs**

This section examines – through a simple model – the effects of bankruptcy law features on firm’s choices in three different stages of the firms’ life: before the financial distress, after the financial distress and before the bankruptcy and finally after the bankruptcy.

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<sup>17</sup>Greenwood and Jovanovic (1990).

<sup>18</sup>Beck, Demirgüç-Kunt, and Levine (2004).

### 3.3.1. The Ex Ante Financial Distress Effects

A good bankruptcy law is not only relevant when a firm goes bankrupt, but also has strong ex ante effects on the cost of capital and the incentive to pursue projects, which are as important as the ex post bankruptcy effects. The relationship between the performance of the bankruptcy system, a firm's cost of capital, and its incentive and ability to pursue projects can be illustrated with a simple model. We make five important assumptions: the borrowing firm is run by an owner/manager; creditors are imperfect monitors of actions related to payoffs that the firm takes after it borrows; capital markets are competitive; creditors can predict their mean payoffs in the default state; and creditors and the firm are risk-neutral. We make the first assumption because this essay is not concerned with the corporative-governance problem. The second assumption captures the asymmetric information between the firm and its creditors. The third is realistic. The fourth rests on the view that professional creditors have considerable experience with default, and the fifth is more accurate when applied to firms than to individual persons.

The borrowing firm has a project that requires capital,  $I$ , which the firm must raise externally. The firm promises to repay creditors the sum,  $F$ . The project can return a value,  $v$ , where the firm is solvent if  $v \geq F$  and insolvent if  $v < F$ . Two states are possible in the future, one if the firm is solvent and the other if it is not.

The solvency and insolvency states return to the firm  $v_{solv}$  and  $v_{ins}$ , respectively, where  $v_{solv} \geq F > v_{ins}$ . The probability of solvency is  $p_{solv}$ ; the probability of insolvency is  $(1 - p_{solv})$ . This implies that the expected value of the project is  $E(v) = p_{solv}v_{solv} + (1 - p_{solv})v_{ins}$ , the expected return conditional on the solvency state is  $E_{solv}(v) = v_{solv}$ , and the expected return conditional on the insolvency state is  $E_{ins}(v) = v_{ins}$ . The bankruptcy system costs  $c$  to run. A bankruptcy system can thus distribute to the creditors of an insolvent firm at most  $v_{ins} - c$ , so the repayment to creditors is  $F$  if the firm is solvent and  $v_{ins} - c$  if it goes bankrupt.

Because the credit market is competitive,  $F$  is the largest sum that creditors can demand to fund the project. The risk-free interest rate is assumed to be zero, so that a borrowing firm's interest rate is a function only of the riskiness of its project and the properties of the bankruptcy system in place.

**3.3.1.1. Investment problem.** Creditors who lend  $I$  should expect to receive  $I$  in return. This expectation can be written as follows:

$$I = p_{solv}F + (1 - p_{solv})(v_{ins} - c);$$

$$(3.1) \quad F = \frac{I - (1 - p_{solv})(v_{ins} - c)}{p_{solv}}$$

If the expected value that creditors receive conditional on insolvency increases (that is,  $v_{ins} - c$  rises), then  $F$  declines, diminishing the interest rate charged by creditors. The more that creditors expect to receive in the insolvency state, the less they will require the firm to repay in the solvency state. The firm's interest rate is  $r = (F/I) - 1$ , which is increasing in  $F$ ; this is the value that the firm is required to repay in the solvency state. Denoting by  $v_{ins}^u$  and  $c^u$  the per-unit-of-investment ( $I = 1$ ) counterparts of  $v_{ins}$  and  $c$  we also have

$$r = \frac{1 - p_{solv}}{p_{solv}} [1 - (v_{ins}^u - c^u)],$$

which is decreasing in the probability of success and in the return of insolvency states.

**Proposition 7.** *A higher (lower) expectation of return in the insolvency state reduces (raises) the interest rates charged by the creditors.*

The bankruptcy system affects both elements that make up the return in cases of insolvency ( $v$  and  $c$ ). To speed up the bankruptcy procedure decreases the cost of the procedure ( $c$ ) and brings ex ante gains. Moreover, the return is affected by the procedure choice. If the



return in reorganization (liquidation) is greater than in liquidation (reorganization) – that is,  $v_R > v_L$  ( $v_R < v_L$ ) – then the firm should be reorganized (liquidated). Thus, the firm’s insolvency-state value is higher in a system that liquidates economically inefficient firms and saves economically efficient (but financially distressed) firms than it would be in a system that attempted to save or liquidate all firms.

$F$  and thus  $r$  will also increase if creditors receive only a fraction of the insolvency return ( $v_{ins} - c$ ). Two characteristics of bankruptcy law may affect the insolvency return in this way. First, if reorganization is allowed, violations of the absolute priority rule may occur, with some portion of value in bankruptcy going to shareholders even when creditors are not paid in full. Second, some bankruptcy laws decree the priority of tax or labor claims over secured creditors’ claims; this characteristic is very common in developing countries.

Suppose that  $l$  is the value of claims that came before creditors’ claims or the expected amount that shareholders extract in insolvency states. Then,

$$I = p_{solv}F^l + (1 - p_{solv})\max(v_{ins} - c - l, 0).$$

Defining  $(v_{ins} - c - l)^+ = \max(v_{ins} - c - l, 0)$ , we have

$$F^l = \frac{I - (1 - p_{solv})(v_{ins} - c - l)^+}{p_{solv}}.$$

The creditors’ insolvency return may fall to zero in this situation, which would strongly increase the cost of capital.

**Proposition 8.** *APR violations and the priority of labor or tax claims over creditors’ claims increase the cost of capital.*

An ex ante objective of bankruptcy law should be to maximize the project option set that creditors want to finance. Low capital costs are fundamental to this objective.

Society prefers firms that pursue projects with positive expected returns. A firm should therefore undertake a project that creates value. We denote social welfare as  $W$ , such that

$$\begin{aligned} W &= p_{solv}v_{solv} + (1 - p_{solv})(v_{ins} - c) - I \geq 0 \text{ and} \\ W &= p_{solv}E_{solv}(v) + (1 - p_{solv})E_{ins}(v - c) - I \geq 0 . \end{aligned}$$

As social efficiency always requires a minimum conditional expectation value of return,  $E_{solv}(v)$ , we let  $W = 0$ . Then,

$$(3.2) \quad E_{solv}(\underline{v}) = \frac{I - (1 - p_{solv})E_{ins}(v - c)}{p_{solv}},$$

where  $F = [I - (1 - p_{solv})E_{ins}(v - c)]/p_{solv}$  is identical to the right-hand side of  $E_{solv}(v)$ .

Since equation 1 solves for the minimum repayment promise the firm must make to obtain financing and equation 2 solves for the minimum conditional expected return that is socially accepted, the equations show that it is socially efficient for firms to take all projects that creditors will finance. More precisely, since  $E_{solv}(\underline{v})$  is the minimum return conditional on solvency states accepted by the society, it is socially optimal that firms take every project that makes  $E_{solv}(v) \geq E_{solv}(\underline{v})$ . Debtors will thus be able to fulfill their promises in solvency states, since equation 1 equals equation 2. This equality does not hold in the presence of APR deviations or claims with priority above creditors' claims, as  $F$  would increase, and certain socially efficient projects would not be financed. If a socially acceptable project (with  $W > 0$ ) returns  $E_{solv}(v) \geq E_{solv}(\underline{v})$ , and if  $E_{solv}(v) < F$ , then creditors would never be fully repaid (that is, there are no solvency states) and they would therefore have no interest in financing such projects. Therefore, creditors would not finance projects with a solvency return in the range of  $[\underline{v}_{solv}, v_{solv}^F)$ , where  $v_{solv}^F = F$ , even though they are socially efficient.

**Proposition 9.** *If creditors' claims have top priority and if there are no APR violations, then all socially efficient projects are financed.*

**Proposition 10.** *If APR violations are allowed or if other claims come before creditors' claims, then a set of socially efficient projects would not be financed.*

Thus far, we have studied the set of projects that are socially efficient. We now examine the borrowers' incentives to invest. The interest rate imposes the expected costs of failure on firms, so that under APR a firm's expected return, when it borrows, becomes

$$(3.3) \quad \begin{aligned} E(R^B) &= p_{solv}(v_{solv} - F) + (1 - p_{solv})(0) \geq 0; \\ E(R^B) &= p_{solv} [E_{solv}(v) - F] \geq 0. \end{aligned}$$

Substituting for  $F$  from equation 1 yields

$$E(R^B) = p_{solv}E_{solv}(v) + (1 - p_{solv})E_{ins}(v - c) - I \geq 0,$$

which is the expression indicating that the project is socially efficient. This equation holds with equality for the minimum conditional expected return,  $E_{solv}(\underline{v})$ . Therefore, the borrower invests in all projects that creditors will finance and that are socially efficient.

**Proposition 11.** *If creditors' claims have top priority and if there are no APR violations, a profit-maximizing firm will pursue projects that creditors will finance and that are socially efficient.*

**3.3.1.2. Moral hazard problem.** We now introduce an asymmetric-information problem with regard to the level of effort that firms financing with debt choose when pursuing projects. Since creditors do not observe the variable effort, they are not able to know whether a borrowing firm chose the optimal effort level. Thus far, we have implicitly assumed that the

probability that the firm's project would succeed,  $p_{solv}$ , was exogenous, and therefore  $p_{solv}$  did not depend on what the firm did. When we take effort into account, we assume that the probability of success increases with the firm's effort level. In precise terms, we assume that  $p_{solv}(e)$  is differentiable, strictly increasing, and strictly concave in the effort variable,  $e$ , that  $\lim_{e \rightarrow 0} p'_{solv}(e) = \infty$  and  $p_{solv}(\infty) < 1$ . The last two conditions means respectively that it is efficient for the firm to choose a positive effort level, and that is ever possible the insolvency state, even when  $e = \infty$ .

The effort level is costly to the manager (borrower), although it increases the probability of the firm's success. The first problem emerges because the socially optimal effort is different from the optimal private effort. From the social perspective,

$$\begin{aligned} \max_e W &= p_{solv}(e)v_{solv} + [1 - p_{solv}(e)](v_{ins} - c) - e - I \\ p'_{solv}(e_{soc}) &= \frac{1}{v_{solv} - (v_{ins} - c)}. \end{aligned}$$

The socially optimal effort is the level of effort that makes the marginal gains from the higher probability of success equal to the marginal cost of exerting such an effort.

From the manager's perspective,

$$\begin{aligned} \max_e E(R^B) &= p_{solv}(e)(v_{solv} - F) + [1 - p_{solv}(e)](0) - e \\ p'_{solv}(e_{priv}) &= \frac{1}{v_{solv} - F}. \end{aligned}$$

The manager exerts effort until the marginal private gain from the higher probability of success is equal to the marginal cost to exert such an effort. The difference between the social and private problems arises because the firm divides its gain with creditors in the success state, while the marginal cost is the same for both. Therefore, since  $F > v_{ins} - c$  (otherwise the firm would be solvent),  $p'_{solv}(e_{priv}) > p'_{solv}(e_{soc})$ , which implies that  $e_{priv} < e_{soc}$ .

**Proposition 12.** *Any bankruptcy system produces a weaker effort than is socially optimal.*

Some characteristics of bankruptcy law may reduce the private level of effort exerted by managers. For example, when the law puts tax or labor claims before creditors' claims, creditors' gains are diminished in insolvency states, making the payment in solvency states higher ( $F^l > F$ ). This implies that  $p'_{solv}(e_{priv}^*) = 1/(v_{solv} - F^l) > 1/(v_{solv} - F) = p'_{solv}(e_{priv})$  and  $e_{priv}^* < e_{priv}$ , reducing the private level of effort. Closer payoffs lower the incentive to avoid insolvency states. Another example is a bankruptcy system that allows violations of APR. Suppose that managers extract  $l$  in insolvency states, such that

$$\begin{aligned} \max_e E(R^B) &= p_{solv}(e)(v_{solv} - F^l) + [1 - p_{solv}(e)](l) - e; \\ p'_{solv}(e_{priv}^{**}) &= \frac{1}{v_{solv} - F^l - l}. \end{aligned}$$

This implies that  $p'_{solv}(e_{priv}^{**}) = 1/(v_{solv} - F^l - 1) > 1/(v_{solv} - F) = p'_{solv}(e_{priv})$  and  $e_{priv}^{**} < e_{priv}$ , which again reduces the private level of effort. When managers receive a payoff in insolvency states, they have less incentive to work to prevent insolvency, creating a moral hazard problem.

**Proposition 13.** *The private level of effort is reduced when the bankruptcy system gives priority to tax or labor claims over creditors' claims and when managers are paid in insolvency states.*

Underinvestment in effort exacerbates the financing problem shown before. The probability of success declines as the firm exerts less effort, thereby increasing the minimum conditional expectation value of return and shrinking the set of fundable projects.

### 3.3.2. The Ex Post Financial Distress and Ex Ante Bankruptcy Effects

In this section, we look at firms that are financially distressed, but have not yet filed for bankruptcy. Managers of failing firms can cause two effects: the gambling effect, which occurs when managers attempt to avoid bankruptcy, and the delay effect, when managers attempt to delay filing for bankruptcy.

**3.3.2.1. The gambling effect.** Managers of firms in financial distress have an incentive to undertake excessively risky investments as a means of avoiding bankruptcy. If risky investment succeeds, its high returns enable the firm to avoid bankruptcy, at least temporarily; if it fails, the firm goes bankrupt. In the latter case, managers are no worse off since the firm would have gone bankrupt anyway without the investment, and managers cannot get less than zero, which is what they receive in case of bankruptcy. Equity holders are also in favor of risky investments in this situation of financial distress, since equity is likely to be worth zero if bankruptcy occurs. Losses on risky investment are passed on to creditors in the form of a lower expected return.

We now consider a multiperiod model following the model used earlier.<sup>19</sup> At time  $t = 0$ , the firm borrows  $I > 0$  and agrees to pay  $F$ , where  $F = I(1 + r)$ , in solvency states. At time  $t = 1$ , the firm enters financial distress, but it still owns an amount,  $Z > 0$  ( $Z < F$ ), in cash that the manager will use to make a choice between two projects, one risky and another risk free. At  $t = 2$ , the firm's final output,  $v$ , is realized, and this is divided among equity holders and creditors. All the hypotheses outlined earlier still hold.

If managers choose the risk-free project, then the final output,  $v$ , will be  $Z$ , where  $Z < F = I(1 + r)$ . If they choose the risky project, then the final output,  $v$ , will be  $\gamma R$ , where  $R$  is the expected return, which is positive, and  $\gamma$  is a random variable with an expected value equal to 1. Let  $\gamma$  be distributed discretely in the interval  $[0, \bar{\gamma}]$ , where  $\bar{\gamma} > 1$ . At  $t = 1$ , the equity holders observe  $R$  and the range, but the value of  $\gamma$  is realized in  $t = 2$ .

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<sup>19</sup>The model follows Bebchuk (2002).

Given the information available in  $t = 0$ , the parties know  $Z$  but only the distribution of  $\gamma R$  in  $[0, \bar{\gamma}R]$ . The risky project may offer a higher or lower expected return than the risk-free project. The moral hazard problem is that equity holders may choose the risky project even if  $R < Z$ . At  $t = 2$ , the final output is realized and divided among equity holders and creditors. Under APR and zero bankruptcy costs ( $c = 0$ ), a solvent firm pays equity holders  $v - F$  and creditors  $F$ .<sup>20</sup> If the firm is insolvent, equity holders receive nothing (because  $v < F$ ) and creditors receive  $v$ . Therefore, the return for equity holders is  $\max(v - F, 0)$  and for creditors is  $\min(F, v)$ .

We now examine how managers decide between projects at  $t = 1$ . Once managers observe the value of  $R$  and its distribution, they will choose the risky project if and only if

$$(3.4) \quad E_{\gamma} \max[\gamma R - I(1 + r), 0] \geq \max[Z - I(1 + r), 0].$$

Let  $R_{AP}(r)$  be the smallest nonnegative value of  $R$  that makes the left- and right-hand sides of equation 4 equal. Equity holders will choose the risky project if and only if  $R \geq R_{AP}$ .

If there exists any risky project with expected value equal to  $R \leq Z$  that does not always lead to insolvency – that is,  $\gamma R > I(1 + r)$  in some state of nature – it makes the left-hand side strictly greater than the right-hand side, and managers prefer it over the risk-free project. Since this exercise deals with choices after the firm enters financial distress, we have  $Z < I(1 + r)$  and  $\max[Z - I(1 + r), 0] = 0$  as the return to equity holders for the risk-free project; then, by construction,  $R_{AP}(r) = 0$ . It follows that for any given  $r$ ,  $R_{AP}(r) < Z$ , since  $R_{AP} = 0$  and  $Z > 0$ . This inequality implies that managers may choose the risky project even if  $R < Z$ , as long as  $R > 0$  and in some state of nature  $\gamma R > I(1 + r)$ . Equity holders may choose the risky project inefficiently because they have more to gain from a favorable outcome of this project than they have to lose from an unfavorable outcome.

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<sup>20</sup>We discuss the effect of APR violations below.

**Proposition 14.** *If a firm is in financial distress and the bankruptcy system follows an APR, then managers will undertake risky projects even if this produces economic costs ( $Z - R > 0$ ).*

Now suppose that the reorganization procedure is available, allowing deviations from the APR. In this case, equity holders will be able to obtain some value regardless of how small  $v$  turns out to be. If the firm is in financial distress,  $Z < I(1 + r)$ , equity holders will be able to obtain  $\alpha v$ , where  $\alpha > 0$ . Moreover, by using or threatening to use the reorganization procedure, equity holders will be able to get more than their contractual right if the firm is sufficiently close to insolvency – that is, if  $v$  exceeds  $I(1 + r)$  by a sufficiently small amount.<sup>21</sup> For simplicity, we assume that the equity holders will always be able to get at least  $\alpha v$  even if their contractual right,  $v - I(1 + r)$ , is less than that. Debt holders will not get full payment, but only  $(1 - \alpha)v < I(1 + r)$ . Thus, if APR violations are allowed, equity holders will receive  $\max[v - I(1 + r), \alpha v]$  and creditors will receive  $\min[I(1 + r), (1 - \alpha)v]$ .

When managers must decide among projects at  $t = 1$ , they will choose the risky project if, and only if,

$$(3.5) \quad E_\gamma \max[\gamma R - I(1 + r), \alpha \gamma R] \geq \max[Z - I(1 + r), \alpha Z].$$

Let  $R_{VAP}(r)$  denote the value of  $R$  that makes the left- and right-hand sides of equation 5 equal. Equity holders will choose the risky project if, and only if,  $R \geq R_{VAP}(r)$ . We now compare the project choices at  $t = 1$  under two regimes. Once the firm is in financial distress, we have  $Z < I(1 + r)$ , and thus  $E_\gamma \max[\gamma R - I(1 + r), \alpha \gamma R] \geq \alpha Z$ . The right-hand side of equation 5 is strictly greater than the right-hand side of equation 4, since  $\alpha Z > 0$ . Furthermore, with  $R_{AP} = 0$ , the left- and right-hand sides of equation 4 are equal. Therefore

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<sup>21</sup>The reorganization procedure provides the possibility of APR violations. If the gains of bankruptcy reorganization are greater than solvency, equity holders will go bankrupt or threaten to go bankrupt to raise their gains.



$$E_\gamma \max[\gamma R_{VAP} - I(1+r), \alpha\gamma R_{VAP}] = \alpha Z > E_\gamma \max[\gamma R_{AP} - I(1+r), 0] = 0,$$

where the first equality holds with  $R_{VAP} > 0$  because  $\alpha Z > 0$ , and the second holds with  $R_{AP}(r) = 0$ . Since  $R_{VAP} > R_{AP}$ , the set of risky projects available to the equity holders decreases, diminishing the investment in risky projects relative to the bankruptcy system that does not provide reorganization and always follows APR. Under both regimes, the equity holders capture the benefits of a favorable outcome of the risky project. When APR violations are allowed, however, safe investments also provide gains for equity holders. This reduces the set of risky projects in which they could invest with higher expected gains, decreasing the amount of risky investment relative to the regime that follows APR. Thus, the availability of a reorganization procedure like Chapter 11 diminishes managers' incentives to invest in inefficient and risky projects.

**Proposition 15.** *When firms are financially distressed, the amount of investment in risky projects is higher in regimes that always follow APR than in regimes that allow APR deviations.*

To illustrate the aggregated gambling effect in the economy, we denote as  $G = Z - R$  the economic cost per failing firm. Suppose that  $1 - p_{solv}$  is the probability that a firm is financially distressed and  $N$  the total number of firms. The aggregated gambling effect is then  $(1 - p_{solv})NG$ . However,  $[1 - p_{solv}(e)]$  is negatively related to the managers' effort,  $e$ , since higher effort is less likely to result in financial distress. Bankruptcy thus entails a trade-off between the punishment effect and the gambling effect. As described earlier, managers have an incentive to work hard when there are no payoffs in bankruptcy states (APR). This results in fewer financially distressed firms because once  $p_{solv}(e)$  increases, the proportion of firms in financial distress falls,  $\downarrow (1 - p_{solv})N$ . Once firms are in financial distress, however, this system gives the manager the incentive to gamble to avoid bankruptcy, giving  $G$  a high

value. A lenient bankruptcy system that violates APR leads to a weaker effort than the former, thus increasing the proportion of firms in financial distress, but this system gives the manager fewer incentives to gamble than the hard system. The final effect is ambiguous, with a trade-off between effort and the incentive to gamble. If we consider the system that gives other claims priority over creditors' claims, the final result is no longer ambiguous because it provides the negative effect in effort (proposition 7) and does not diminish the equity holders' gamble, since they still gain nothing in insolvency. The proportion of financially distressed firms increases and the gamble remains constant, thereby increasing the aggregate gamble effect.

**3.3.2.2. The delay effect.** Managers of financially distressed firms have an incentive to delay filing for bankruptcy, especially if they are automatically replaced in bankruptcy. To analyze the effects of APR violations, we need to introduce one more source of asymmetric information in addition to the manager's effort choice: at an intermediate stage, the manager alone receives a signal about the project's prospects. The idea is to analyze the trade-offs between these two conflicting goals.<sup>22</sup> On the one hand, creditors want a bankruptcy procedure to follow the APR and be harsh on the borrower, since a severe punishment may increase the borrower's incentive to generate sufficient earnings to repay. On the other hand, creditors want to prevent the waste of resources that takes place if a rescue is necessary but not undertaken in time, and the way to obtain this information is to reward poor outcomes. This reward should be bigger than (or at least equal to) the pecuniary gains that managers would receive during the delay period, so as to give them an incentive to declare the financial problems at the right time. However, this works against effort incentives and aggravates the moral hazard problem, because it diminishes the punishment in bad states of nature. It is not clear a priori whether one of the incentive problems is more relevant than the other.

The optimal resolution depends on the parameters of the economy. A bankruptcy system that allows APR violations rewards entrepreneurs if they cooperate in a rescue by

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<sup>22</sup>See the theoretical approach in the working paper version, Araujo and Funchal (2005).

starting early. This reward violates APR because it must be paid even if some of the firm's debt is not paid in full. This procedure allows an efficient rescue or an efficient early liquidation, mitigating the delay effect. At the same time, it does not motivate the firm to exert the right effort, because the firm receives a nonzero payoff in bad states. The optimal procedure thus depends on which incentive the parties want to encourage: optimal effort, at the cost of foregoing the opportunity of an efficient early intervention, or optimal disclosure, at a cost of reducing the incentive to effort.

To see the aggregate effect, let  $A$  equal delay-related losses per insolvent firm. The number of firms in financial distress is  $[1 - p_{solv}(e)]N$ , so the total cost of delay is  $[1 - p_{solv}(e)]NA$ . As in gambling, a bankruptcy law with strong punishment to debtors raises their incentive to work hard,  $\downarrow [1 - p_{solv}(e)]N$ , but with a negative effect on delay in declaring bankruptcy  $\uparrow A$ . A lenient bankruptcy system leads to the opposite result. The final effect is ambiguous with a trade-off between effort and the incentive to delay. If we consider the system that gives other claims priority over creditors' claims, the final result is no longer ambiguous because it provides a negative effect on effort (proposition 7) and does not reward debtors to motivate optimal disclosure. This increases the proportion of financial distressed firms while the delay remains constant, increasing the aggregate delay-related losses.

### 3.3.3. The Ex Post Bankruptcy Effects

From an ex post efficiency perspective, a bankruptcy law should maximize the total value of the company. This objective entails three main elements. First, as little value as possible should be dissipated during the process (minimizing the cost,  $c$ ), so it is desirable to minimize the length of the process – essentially time spent by equity holders on delay tactics, not the time spent on the complexity of claims – and the direct and indirect costs incurred during the process. Second, when the reorganizing process ends, the company's assets should be located at their highest use value. Finally, when a firm enters bankruptcy, the procedure

should be chosen correctly; otherwise, the company's assets will not produce their highest value.

The ex post bankruptcy division of firms' value among the participants has important ex ante consequences, as discussed earlier. However, whether the beneficial effects of APR deviations exceed the negative effects is quite indeterminate. Here we analyze how the characteristics of bankruptcy affect both the maximization and division of companies' value.

**3.3.3.1. Filtering failure.** Financially distressed firms can be divided into two classes: firms that are economically efficient (that is, the best use of their capital is the current use) and firms that are economically inefficient (that is, the value of their assets would be greater in some other use). When an economically inefficient firm enters bankruptcy, the best outcome is for its assets to be liquidated, thereby releasing its capital to higher-value uses. In contrast, when an economically efficient firm enters bankruptcy, the best outcome is for it to continue operating, since its capital has no higher-value use. There is thus an economic justification for having two separate bankruptcy procedures.

Nevertheless, while financial distress is observable, economic efficiency depends on some unobservable variables, such as the earnings of the firm's assets in the best alternative use. Classing firms as efficient or inefficient is thus quite difficult. This situation produces the so-called filtering failure in bankruptcy. The two basic failures that can occur are type I errors, when economically efficient firms in financial distress are liquidated instead of reorganized, and type II errors, when economically inefficient and financially distressed firms are saved through reorganization instead of being liquidated.

Each country has its own means of assigning financially distressed firms to a liquidation or reorganization procedure, so the extent of type I and type II errors varies from country to country. Countries where reorganization is rare, like England, probably have high levels of type I error. Conversely, countries where liquidation is rare probably experience high levels of type II error.

One important factor in filtering failure is who decides whether to save failing firms. In countries where the court appoints officials to take this responsibility, the system should not favor the occurrence of either type of error, provided the officials' decisions are unbiased. In contrast, high levels of type II error are likely to occur in countries like the United States, where managers have the right to choose between liquidation and reorganization.<sup>23</sup>

As a general rule, ex post efficiency requires the availability of both bankruptcy procedures. Suppose that a financially distressed and economically efficient firm goes bankrupt. The optimal solution in this case is reorganization that returns  $v_R$ . If type I error occurs, it returns  $v_L < v_R$ . This eliminates ex post efficiency and, by proposition 1, increases the cost of capital. The same logic is valid for a type II error.

In addition to the positive effect on credit market, the minimization of filtering failure improves the efficiency of the economy's production factors. Improved efficiency is achieved when the most efficient firms continue to operate, once economically efficient but financially distressed firms are rehabilitated, and the assets of economically inefficient firms are transferred to a more efficient use through liquidation.

**3.3.3.2. Bargaining in reorganization.** We start our discussion of bargaining by considering how the features of a reorganization process – like Chapter 11 – affect the division of value. Bebchuk and Chang's model identifies three reasons why equity holders might be able to extract value even when creditors are not paid in full.<sup>24</sup> First, if equity holders delay agreement over a plan, a favorable resolution of uncertainty may cause the value of the firm to exceed the value of its debt. These equity holders have an option value, and they must be compensated if they are to forgo it. Second, if equity holders delay agreement, the company will incur financial distress costs during the bargaining process, which will dissipate some of the value that debt holders can expect to receive at the end of the process. Creditors may therefore agree with a plan to save these costs, obtaining a share of these savings in return for

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<sup>23</sup>See White (1994), who uses an asymmetric information game to model whether U.S. bankruptcy procedure leads to filtering failure.

<sup>24</sup>Bebchuk and Chang (1992).

their consent. Third, in countries that give management the power to propose reorganization plans (like the United States), the bargaining power of equity holders is enhanced, which strengthens their bargaining position and helps them gain a larger share of the extra value.<sup>25</sup> This bankruptcy design allows APR violations and thus sets up the trade-off exposed in earlier sections, with benefits in gambling and delay effects, but with negative results in terms of the effort incentive and perhaps the cost of capital.

The reorganization process under the existing bargain-based rules takes a long time.<sup>26</sup> The delay tactics of equity holders and the complexity of the firm's claims dictate the length of the process. During this period, substantial value might be dissipated. Potential buyers may be reluctant to deal with the company, or they may demand especially favorable terms while the company is insolvent. Moreover, the reorganization process involves substantial administrative costs, and the company under reorganization might incur substantial indirect costs from functioning throughout the reorganization process. All these costs grow as time passes.

All these factors increase the cost in insolvency states. If the return in reorganization is  $v$ , creditors get  $v - c$ , where  $c$  is the cost of the procedure. A bankruptcy law that minimizes such costs ( $c^m < c$ ) by reducing either the delay tactics of equity holders or the administrative and indirect costs of the procedure diminishes the bargain power of managers ( $l^m < l$ ). This increases creditors' returns in insolvency state ( $v - c^m - l^m > v - c - l$ ) and lowers the cost of capital (see proposition 1). A reorganization procedure that minimizes managers' bargaining power produces the same benefits of APR violations, but at lower costs. These lower costs mean a lower payment to managers (1) and alleviation of the moral hazard problem related to the manager's effort.

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<sup>25</sup>For empirical studies, see Franks and Torous (1989); LoPucki and Withford (1990); Eberhart Moore, and Roenfeldt (1990).

<sup>26</sup>See LoPucki and Withford (1990).

### 3.4. Evaluating Bankruptcy Law in Latin America

Many Latin American countries, particularly in South America, have reformed their bankruptcy procedures since the 1980s, aiming to provide a more attractive environment for business. The majority of these reforms centered on creating or improving the reorganization procedure to support the survival of viable businesses in financial distress. Reducing the costs of the bankruptcy procedure was also an important goal. Brazil and Ecuador, for example, simplified their legislations to make the procedure easier and faster, while Bolivia and Colombia (and again Brazil) created an out-of-court reorganization procedure. Reducing the costs of bankruptcy tends to increase the amount to be divided among creditors, thereby reducing the cost of capital.

Chile was the first to reform its system in the early 1980s. The new law clearly defined the rights of each creditor and replaced public officials with private ones. The first change operates to improve the forecast of creditors' return in insolvency states; the second change reduces the bureaucracy, cost, and length of the process. The reform lowered the cost of capital, raised investments and the efficiency, fostered a large ratio of private credit to GDP, and promoted growth.<sup>27</sup> Moreover, a good guarantee system, like mortgages for housing, and an efficient enforcement procedure support the smooth functioning of Chile's bankruptcy law. The Chilean insolvency system still has many negative aspects, however. For instance, the current law does not aim to keep viable businesses in operation (high possibility of type I errors); it does not provide incentives for creditors to monitor debtors (high possibility of fraud); the average time of the procedure is (still) too long; and it lacks specialized bankruptcy courts. These problems have given rise to new recommendations to reform the Chilean bankruptcy system.<sup>28</sup>

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<sup>27</sup>Bergoing and others (2002) argue that the Chilean bankruptcy reform was an important factor for its faster recovery (compared to Mexico that had many similarities in initial conditions) from the economic crises in the early 80's.

<sup>28</sup>See Bonilla and others (2004).

In Mexico, bankruptcy law of 1943 proved insufficient to respond effectively to the problems generated by the 1994 economic crisis, and policymakers began to consider a new commercial bankruptcy law. The new law, which was passed in May 2000, was designed to provide restructuring for commercial debtors as an alternative for viable distressed firms, together with an orderly liquidation of the estate, if necessary.<sup>29</sup> Both measures work to increase the return of the insolvent firm. The first provides the opportunity for efficient firms to stay in business, improving the balance between liquidation and reorganization and reducing filtering failure—and thereby enhancing the efficiency of the production factors. The second measure prevents the inefficient dismantling of the firms' asset caused by uncoordinated debt collection. While the new law may seem to favor restructuring, a careful reading reveals that the reform may actually favor liquidation, with the primary aims of strengthening creditors' rights and enhancing resource allocation (whereas both liquidation and restructuring were secondary).<sup>30</sup> Some of the most important features of the reform are as follows: the federal district court was given original and exclusive jurisdiction over bankruptcy cases; the Federal Institute of Bankruptcy Specialists (IFECOM) was created to supervise insolvency administrators and establish procedural rules for insolvency cases; guidelines were established for the administration and disposition of the bankruptcy estate; and international cooperation was facilitated by the adoption of the United Nations Commission on International Trade Law (UNCITRAL) Model Law on Cross-Border Insolvencies, with the reciprocity clause. The negative aspect is that the whole process is too bureaucratic and very dependent on the IFECOM.

The Argentine bankruptcy law underwent three reforms in seven years. The current legal framework for corporate insolvency centers on bankruptcy law of 1995, which replaced the previous system that held from 1972 to 1995.<sup>31</sup> The most recent law provides for both reorganization and liquidation, allowing the possibility to rescue viable businesses and closing

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<sup>29</sup>See Johnson and Alonso (2004).

<sup>30</sup>We thank Sara Castellanos for her comments, which were very useful in clarifying this issue.

<sup>31</sup>See Johnson and Alonso (2004).



the inefficient ones. This change has a positive impact on aggregate economic efficiency and filtering failure. After several modifications, the new law now establishes a modern liquidation procedure and a reasonably modern reorganization procedure that is largely consistent with best practices. These modifications reduced the length of the procedure and its cost, increasing the expected return of creditors and the credit market. In February 2002, an emergency law was enacted to help stabilize the corporate sector, since the country's severe crisis forced many dollar-indebted firms into bankruptcy and, consequently, placed them under the control of creditors (usually banks). The main change was to impose moratoria on the different enforcement actions and precautionary measures of almost all kinds of creditors. Despite the goal of preserving corporate interests in a period of serious crises, this reform could have seriously damaged the credibility of bankruptcy law and ultimately increased the cost of capital, since creditors perceived the changes as reducing their chances of being repaid in bankruptcy states. In May 2002, a new reform was introduced that abrogated most of the emergency measures.

The remainder of this section evaluates the current state of bankruptcy law in Latin American countries. While the design of an optimal bankruptcy law is still an open question, analysts generally agree on two points in this debate. One has to do with the protection that bankruptcy law must provide to creditors, and the other involves the goals-of-insolvency procedure. The measure of the quality of a bankruptcy procedure is based on these two sources. The creditors' protection variable indicates whether bankruptcy law is good enough to make loans attractive to creditors, providing firms with easier access to external finance. The goals-of-insolvency procedure represents the consensus on the characteristics of an efficient bankruptcy procedure. For a comparative analysis, we use seven groups of countries: the Organization for Economic Cooperation and Development (OECD), Latin America and the Caribbean, the Middle East and North Africa, Europe and Central Asia, East Asia and

the Pacific, South Asia, and sub-Saharan Africa.<sup>3233</sup> The data used is from the World Bank and the IMF.<sup>34</sup>

### 3.4.1. Creditors' Protection

The law and finance literature highlights the fact that a good bankruptcy law has to provide legal protection to creditors. Earlier we described how better legal protection enables financiers to offer entrepreneurs money at better terms, which broadens the credit market. Several forms of bankruptcy law are used around the world. Some, like the English law, are too favorable to creditors, giving them strong protection and almost always resorting to liquidation of insolvent firms. Such systems are costly in that they eliminate good firms that are still healthy. Other countries, like Brazil, provide weak protection to creditors, giving labor and tax claims priority over the claims of secured creditors.

This section compares the creditor protection provided by bankruptcy law in different groups of countries and ranks the current situation of Latin America. As a measure of creditors' protection, we use the index constructed by La Porta and others, which summarizes creditors' rights in bankruptcy law interacted with a measure of enforcement.<sup>35</sup> This interaction between law and enforcement is critical because if rules and regulations are not enforced, creditor rights will be inadequate regardless of what is written in the bankruptcy procedure codes.

The creditors' rights index is formed by adding 1 for each of the following conditions: secured creditors are paid first; the manager does not stay in reorganization; the court does

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<sup>32</sup>The Latin American and Caribbean block is composed of Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, the Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Paraguay, Peru, Uruguay, and Venezuela.

<sup>33</sup>The groups of countries are as follows: East Asia and Pacific (EAP); Europe and Central Asia (ECA); Latin America and Caribbean (LAC); the Middle East and North Africa (MENA); the Organization of Economic Cooperation and Development (OECD); South Asia (SA); and Sub-Saharan Africa (SSA).

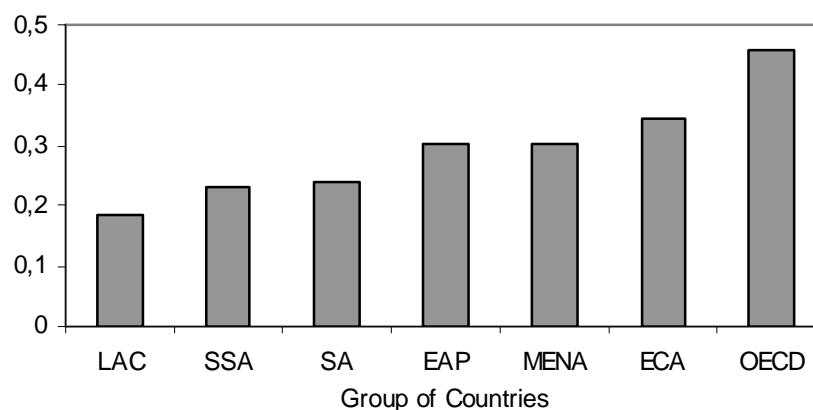
<sup>34</sup>World Bank, *Doing Business* (2003, 2004) and *World Development Indicators* (2004); IMF, *International Financial Statistics* (2004).

<sup>35</sup>La Porta and others (1997). Their creditors' rights measure is calculated from a sample of forty-nine countries and refers to 1996.

not impose an automatic stay; and creditors need to consent to file the reorganization petition. The measure of legal enforcement is the rule of law variable, which assesses the country's legal tradition of law and order.<sup>36</sup> Therefore the creditor protection measure is defined as creditors' rights times the enforcement measure. We normalize this measure to vary between [0, 1], where a score of 1 means that the country provides the strongest level of protection to creditors and zero means that the country does not protect creditors at all.

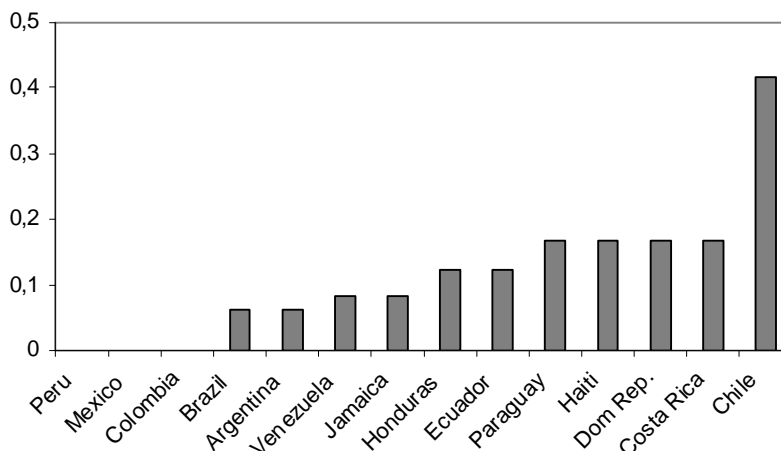
Figure 1 shows creditor protection in different sets of countries. The OECD has the highest level of creditor protection, while the Latin American and Caribbean region has the lowest. The poor creditor protection in Latin America and the Caribbean reduces creditors' interest in the credit market and increases the cost of capital, making it difficult for firms to finance their investments with debt.

**Figure 1: Creditor Protection, by Group of Countries**



Within Latin America and the Caribbean, the Chilean legal system provides the highest level of creditor protection, on par with the average OECD country (see figure 2). Most countries, however, vary between 0.05 and 0.17, which is a very low level in a measure ranging between 0 and 1.

<sup>36</sup>The rule of law index is computed in the PRS Group's International Country Risk Guide (2004).

**Figure 2: Creditor Protection, by Latin American Country**

A common notion in the law and finance literature is that a good bankruptcy law has to provide strong protection to creditors. La Porta and others were pioneers in studying empirically the relevance of this relationship.<sup>37</sup> Using a sample of forty-nine observations, they show that countries with a high level of creditor protection have high levels of financial development.

We explore the relation between credit market development (measured by the log of private credit over GDP) and creditors' protection in a sample of 120 countries, controlling for GDP (in logs), population (in logs), information sharing, and the quality of enforcement. We control for total GDP on the theory that larger economies may have bigger credit markets because of economies of scale in organizing the supporting institutions. We control for population on the theory that countries with large population tend to be poorer in per capita terms ( $\log \text{GDP} - \log \text{population} = \text{GDP per capita}$ ), with negative effects on the credit market. We use the number of days that the court takes to enforce a simple debt contract as a proxy for the efficiency (or quality) of the legal system. Finally, we control for information-sharing (specifically, the existence of public or private credit registries) to capture the adverse-selection problem in the credit market.<sup>38</sup> Table 2 reports that the coefficient

<sup>37</sup>La Porta and others (1997, 1998).

<sup>38</sup>It is equal one if either a public registry or a private credit bureau operates in the country, and zero otherwise.

of creditor protection is statistically significant at the 5 percent level, and greater the legal protection for creditors corresponds with a larger credit market. The results imply that if, for example, the Brazilian bankruptcy reform shifts creditor protection from the current 0.06 to the mean for Latin America (0.19) or the OECD (0.46), the Brazilian credit market would grow by approximately 9 percent or 30 percent, respectively.

**Table 2. OLS Regression of Private Credit/GDP on Creditors' Protection<sup>a</sup>**

<i>Independent variable</i>	<i>Coefficients</i>	<i>t statistic</i>
Constant	1.06	1.19
Creditors' protection	0.66**	2.28
GDP (in logs)	0.40***	9.30
Population (in logs)	-0.25***	-4.40
Quality of enforcement	-0.0005*	-1.93
Information sharing	0.55***	3.35
<i>Summary statistic</i>		
No. observations	120	
R squared	0.66	
Adjusted R squared	0.64	

\* Statistically significant at the 10 percent level.

\*\* Statistically significant at the 5 percent level.

\*\*\* Statistically significant at the 1 percent level.

a. The dependent variable is the log of private credit over GDP. The sample comprises 120 observations (average for 2000–03). Standard errors and covariance are robust to heteroskedasticity.

Our controls for GDP, per capita GDP, information sharing, population, and quality of enforcement are all significant, with the first three being positive and the last two negative, as we expected. The effect of information sharing on the credit market is considerable, but it is not important to Latin America and the Caribbean once that removing Jamaica from the set, the rest of the countries all have credit registries. If Jamaica were to implement such a mechanism, it would increase its credit market by more than 70 percent. An increase in the quality of enforcement also produces a relevant effect on credit markets. The average time that Latin America and the Caribbean takes to enforce contracts is the highest among the regions, at 462 days. Reducing this period to the average OECD level (230 days) would increase the region's credit markets by 11 percent. Guatemala, which has the lowest quality of enforcement (1,459 days), could expand its credit market by 60 percent if it improved this mechanism to the Latin American average.

To examine which components of the creditors' rights index are responsible for its effect on the credit market, we regress the measure of credit market development on each subindex of creditors' rights. We find that creditors' consent to reorganize and claims priority have a positive effect on credit market, while an automatic stay and the exclusion of managers in the reorganization process have no significance at all.

These results are aligned with the theoretical claims in earlier sections that highlight the negative effect when claims such as labor or tax claims have priority over creditors' claims and the relevance of the role of creditors in reorganization, mainly through the provision of protection and incentives against fraud. According to results shown in table 3, any country that reforms its bankruptcy law to give top priority to secured creditors tends to expand its credit market by 27 percent in absolute terms. Also, creditors' consent in reorganization may increase credit markets by 26 percent in absolute terms. The null effect of an automatic stay and the exclusion of managers from the reorganization process illustrates the ambiguity of both variables. The existence of an automatic stay facilitates the reorganization procedure and reduces type I errors, which increases the firm's value in bankruptcy, while its absence guarantees the fast recovery of secured creditors. The exclusion of managers from reorganization weakens their bargaining power in reorganization, which increases creditors' returns in bankruptcy and raises their incentives to supply credit. It may, however, lead managers to delay filing for bankruptcy and to gamble with the firm's investments as a means of avoiding bankruptcy, both of which reduce creditors' return. We use the same controls as in the last regression, and the results are practically the same.

**Table 3. OLS Reg. of Private Credit/GDP on Each Subindex of Creditors' Rights<sup>a</sup>**

<i>Independent variable</i>	<i>Coefficients</i>	<i>t statistic</i>
Constant	1.32	1.51
Consent of creditors	0.23*	1.74
Priority	0.24*	1.83
No automatic stay	-0.05	-0.37
Manager out	0.17	1.27
GDP (in logs)	0.42***	11.23
Population (in logs)	-0.27***	-5.11
Quality of enforcement	-0.0006**	-2.40
Information sharing	0.60***	3.58
<i>Summary statistic</i>		
No. observations	120	
R squared	0.67	
Adjusted R square	0.64	

\* Statistically significant at the 10 percent level.

\*\* Statistically significant at the 5 percent level.

\*\*\* Statistically significant at the 1 percent level.

a. The dependent variable is the log of private credit over GDP. The sample comprises 120 observations (average for 2000–03). Standard errors and covariance are robust to heteroskedasticity.

### 3.4.2. Goals of Insolvency

Despite all the research on bankruptcy, analysts still do not agree on the best procedure to adopt. It is hard to design an optimal bankruptcy procedure from first principles, given that economists have not yet developed a satisfactory theory of why parties cannot design their own bankruptcy procedures (that is, why contracts are incomplete). However, it is possible to identify a consensus on certain issues, such as some characteristics of an efficient bankruptcy procedure.

Hart outlines three characteristics of a good procedure.<sup>39</sup> First, a good bankruptcy procedure should deliver an ex post efficient outcome, which maximizes the firm's total value available to be divided among the debtor, creditors, and possibly other interested parties. Second, a good bankruptcy procedure should preserve the bonding role of debt by penalizing

<sup>39</sup>Hart (2000).

managers and shareholders adequately in bankruptcy states. Without any adverse consequence at all, they have very little incentive to pay their debts. Finally, a good bankruptcy procedure should preserve the order of claims defined when the contract was created, except that some portion of value should possibly be reserved for shareholders. This has two advantages: it helps to ensure that creditors receive a reasonable return in bankruptcy, which encourages them to lend; and bankruptcy and nonbankruptcy states are not treated differently. However, the absolute priority rule gives management, acting on behalf of shareholders, an incentive to avoid bankruptcy even if this gives rise to inefficient bankruptcy decisions, such as gambling and delay tactics. There may thus be a case for reserving some portion of value in bankruptcy for shareholders.

The World Bank's Doing Business database computes a measure that documents the success in reaching the three goals of insolvency, as outlined by Hart.<sup>40</sup> It is calculated as the simple average of the cost of insolvency (from 0 to 100, where higher scores indicate lower costs), time of insolvency (from 0 to 100, where higher scores indicate less time), the observance of absolute priority of claims, and the efficient outcome achieved.<sup>41</sup> The total goals-of-insolvency index ranges from 0 to 100: a score of 100 on the index indicates perfect efficiency, while 0 means that the insolvency system does not function at all.

Figure 3 shows that Latin American and Caribbean countries do not have an efficient bankruptcy procedure. They only perform better than sub-Saharan Africa and South Asia, while the OECD countries have the best insolvency systems.

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<sup>40</sup>Hart (2000).

<sup>41</sup>The efficient outcome is defined as any bankruptcy procedure that results in either a going-concern sale without an interruption in operations or a successful rehabilitation.



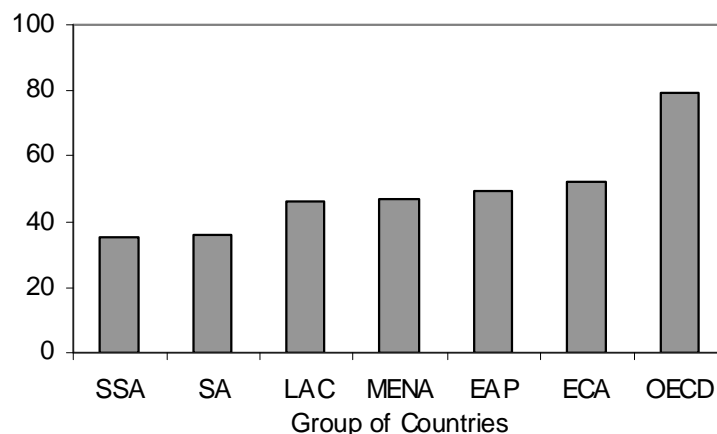
**Figure 3: Goals of Insolvency Index, by Group of Country**

Figure 4 illustrates that an efficient bankruptcy system has a positive effect on the credit market, making access to credit cheaper and easier; these results are aligned with propositions 1 and 3, respectively. This happens because creditors are more confident in having their loans repaid when a firm fails (see third graphic at figure 4). We performed regressions between the goals-of-insolvency index and the interest rate spread, credit market development (log private credit/GDP), and creditors' recovery rate.<sup>42</sup> The regression between the interest rate spread and the goals-of-insolvency index is statistically significant at the 1 percent level, after we control for the log of GDP per capita.<sup>43</sup> For every one point rise in insolvency efficiency, the interest rate spread decreases by 0.13 percent (with a t statistic of 2.58). Credit market development and the recovery rate are positively related with the goals-of-insolvency index and both are statistically significant at the 1 percent level, also controlling by the log of per capita GDP. In this case, for every one point increase in the insolvency efficiency, the log of private credit/GDP and the recovery rate increase by 0.02 and U.S.\$0.0083 on the dollar, respectively (with t statistics of 5.70 and 12.95).

<sup>42</sup>Standard errors and covariance are robust to heteroskedasticity, and R squared varies between 0.16 and 0.67.

<sup>43</sup>To verify whether outliers are driving the result, we use a quantile regression in the median; the coefficient remains negative and significant. We also regress against GDP per capita to control effects of richness or poorness on the credit market.

Figure 4: Effect of Goals of Insolvency Index on the Interest Rate Spread

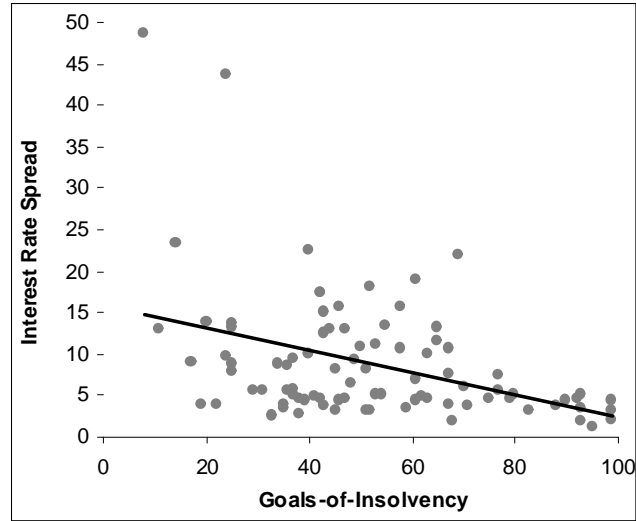
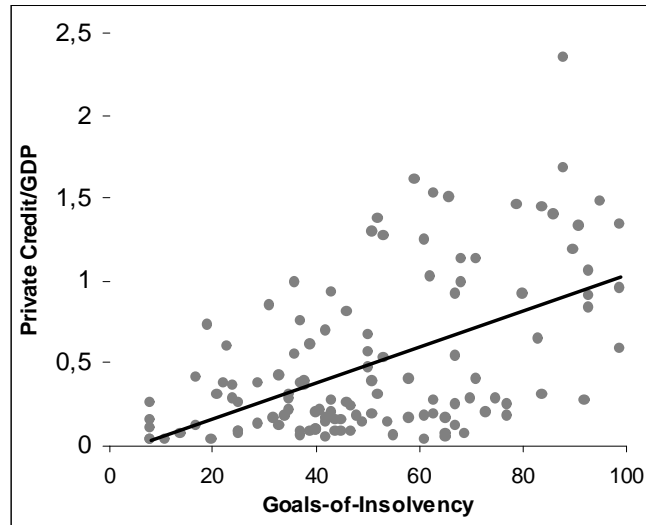
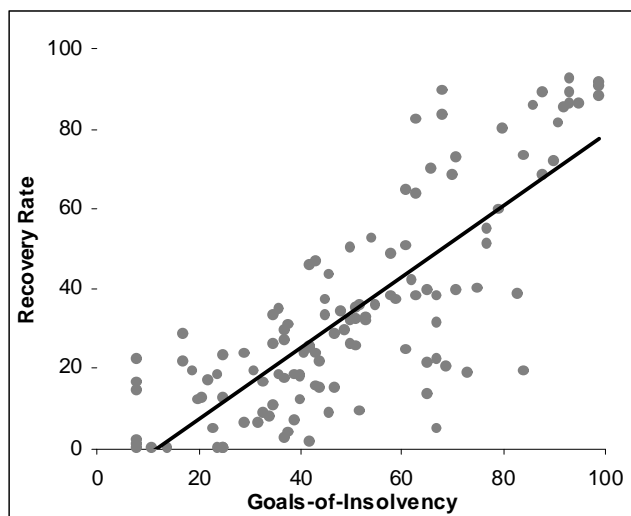


Figure 5: Effect of Goals of Insolvency Index on Private Credit/GDP



**Figure 6: Effect of Goals of Insolvency Index on Creditors Recovery Rate**

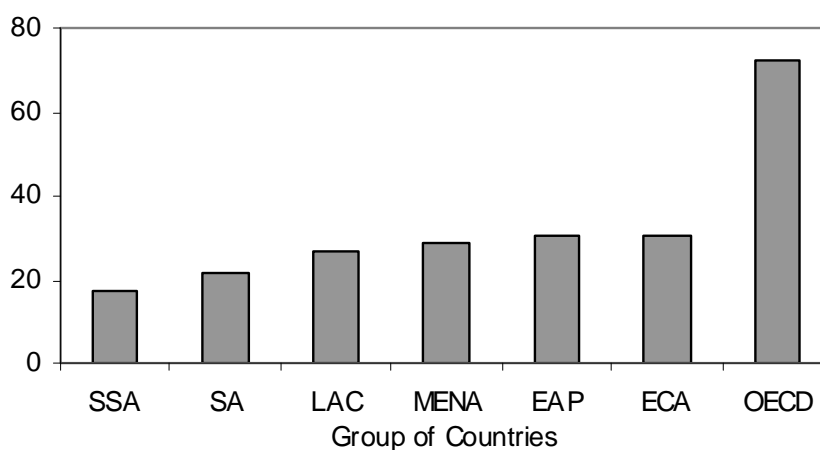
To exemplify the impact of an improvement in bankruptcy efficiency, we use a case in which Brazil increases its insolvency efficiency from 24 to the Latin American average of 46. The interest rate spread would fall by approximately 3 percent (7 percent in relative terms), its private credit rate rises by 19.79 percent (the credit market expands in 55 percent), and its creditors' recovery improves by U.S.\$0.18 on the dollar. If the Latin America average were to increase to the OECD level (80), its interest rate spread would fall 4 percent (33 percent in relative terms), and its private credit and recovery rate would increase by 32.77 percent and U.S.\$0.25 on the dollar, respectively (approximately 97 percent and 93 percent, respectively, in relative terms).

Recovery rates vary widely among countries. The most desirable situation is to have as large a recovery rate as possible, because this increases creditors' return in bankruptcy states and thus reduces the cost of capital. Figure 5 shows that the OECD has the highest recovery rate, with creditors recovering more than U.S.\$0.70 on the dollar when a firm fails. The average in Latin America is U.S.\$0.26 on the dollar, which is only above South Asia and sub-Saharan Africa. The worst result among Latin American countries is from Brazil, with a recovery rate of U.S.\$0.002 on the dollar, while the best result is from Mexico, where

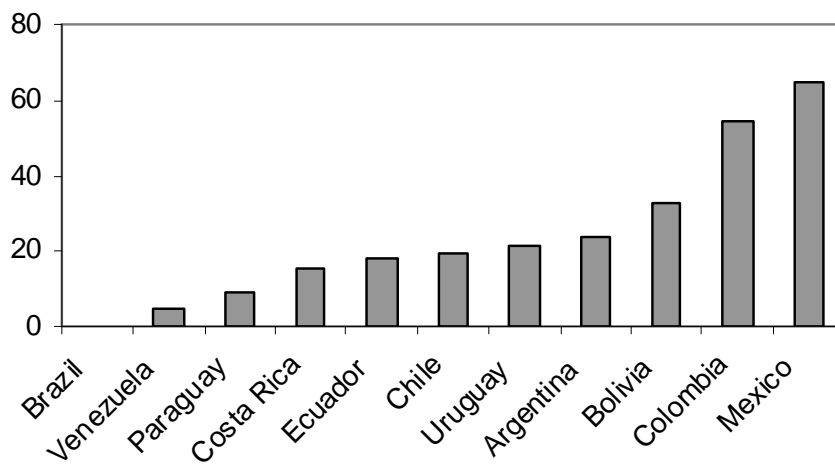
creditors recover U.S.\$0.65 on the dollar (see figure 6). The highest recovery rate in the world is in Japan, with U.S.\$0.92 on the dollar.

This analysis illustrates that Latin American countries would benefit from concentrating their efforts on reforming their bankruptcy systems to incorporate the characteristics listed by Hart. The focus should be on improving the efficiency of bankruptcy procedure and ensuring better credit market conditions.<sup>44</sup>

**Figure 7: Recovery Rate, by Group of Country**



**Figure 8: Recovery Rate of Latin American Countries**



<sup>44</sup>Hart (2000).

### 3.5. Brazilian Bankruptcy Reform

Legislative reform has occurred in several Latin American countries over the last decades. In particular, Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, and Peru focused on their insolvency system, reforming their legal framework for bankruptcy. The most recent reform occurred in Brazil, where lawmakers initiated efforts to update the country's corporate insolvency legislation in 1993. The original project underwent several amendments before the House of Representatives approved it in October 2003. The project was then sent to the Senate, which introduced further improvements to the new law, before approving it in July 2004. The House of Representatives approved the Senate's version in December 2004, and the final law went into effect in June 2005. This section outlines the characteristics of Brazil's former law, the main changes introduced in the reform, and the potential future effects on the Brazilian economy.<sup>45</sup>

#### 3.5.1. The Former Brazilian Bankruptcy Law

The former legal framework for corporate insolvency in Brazil was very fragmented, with the core of legislation for bankruptcy proceedings enacted in 1945. Bankruptcy law regulates both liquidation and reorganization proceedings for merchants (that is, legal entities that engage in commerce in their usual course of conduct). State-owned corporations and public-private joint-stock companies were excluded from bankruptcy proceedings until 31 October 2001, when a modification allowed the bankruptcy of public-private joint-stock companies.

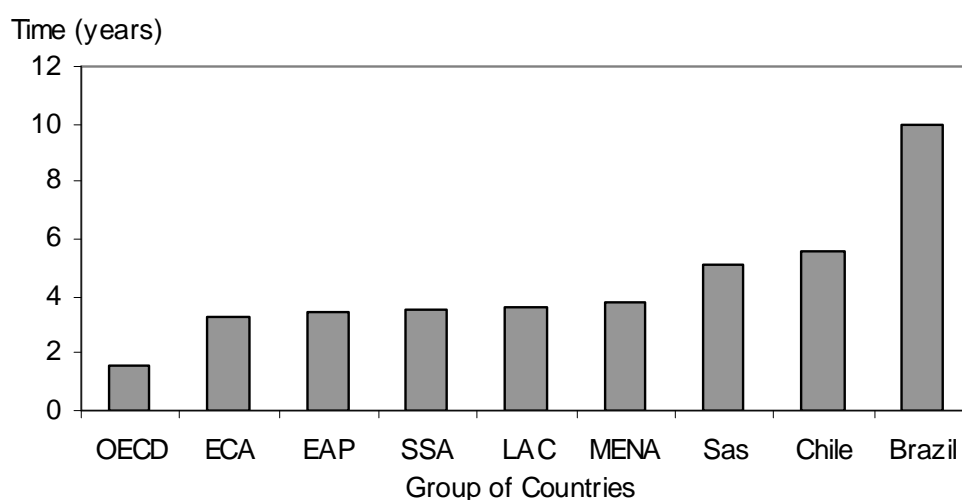
Despite providing both proceedings and aiming to prevent or avoid the liquidation of enterprises, in practice the insolvency process was ineffective at maximizing asset values and protecting creditor rights in liquidation (which raised the cost of capital) – and at salvaging viable distressed businesses (which led to type I errors). The insolvency proceeding was very slow, taking ten years, on average, to complete the whole process. The average insolvency proceeding in Brazil was the slowest in the world and much higher than the mean of Latin

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<sup>45</sup>The appendix describes the reform process in Brazil.

America countries (see figure 7). Liquidation was marked by severe inefficiencies, and the reorganization process was obsolete and too rigid to provide meaningful rehabilitation options for modern business.

**Figure 9: Average Length of Insolvency Proceedings, by Group of Countries and Brazil**



The process of disposing of assets was also slow and highly ineffective, owing to court and procedural inefficiency, lack of transparency, and the so-called *problema da sucessão*, whereby tax, labor, and other liabilities were transferred to the buyer of a liquidated property, which deteriorated the market value of an insolvent company's assets. In addition, the priority given to labor and tax claims had the practical effect of eliminating any protection to other creditors. The process led to an informal use of the system to promote consensual workouts, although an insufficient legislative framework also hampered workouts.<sup>46</sup>

The shortcomings of the former Brazilian legal and institutional system concerning insolvency had several consequences. Creditors' rights were only weakly protected, and financial markets were characterized by a relatively low credit volume and high interest rates. (The ratio of private credit to GDP was only 35 percent and the spread of interest rate was 49 percent, on average, from 1997 to 2002.) Distorted incentives and the lack of effective mechanisms to support corporate restructuring resulted in disproportionately high default rates

<sup>46</sup>A workout is an informal renegotiation of loans that takes place outside the courts.

of potentially viable companies. Exit costs were increased for nonviable companies. Finally, productivity and employment were reduced. The reform aimed to correct these problems.

### 3.5.2. The Credit Market and Changes in Brazilian Bankruptcy Law

The Brazilian bankruptcy law has had a strong effect on the credit market, resulting in an underdeveloped market in which credit is scarce and expensive. Our analysis in this section compares several indicators of the Brazilian credit market and bankruptcy law with the mean of Latin American and OECD countries.

Table 4 reports credit characteristics for the 1997–2002 period. We chose this period because all the countries in our sample have observations for private credit and interest rate spreads for these years. The Brazilian ratio of private credit to GDP is very low compared with the OECD countries, but it is not strongly inferior to the mean for Latin America and the Caribbean. This situation is worse than it seems, however, since a significant share of credit came from the National Bank for Economic and Social Development (BNDES), a development bank that is controlled by the government. BNDES finances a large share of nonhousing investments at a subsidized interest rate. The results for the interest rate spread confirms this chaotic situation: the Brazilian spread is more than four times larger than the average spread in Latin American countries and more than twelve times larger than the average for OECD countries.

**Table 4: Credit Indicators**

<i>Country or region</i>	<i>Private credit/GDP (1997–2002)</i>	<i>Interest rate spread (1997–2002)</i>
Brazil	35.00	49.00
Latin America and the Caribbean	44.23	11.00
OECD	102.75	3.87

Source: World Bank, *World Development Indicators* (2004).

An important reason for this situation in the credit market is the design of the former Brazilian bankruptcy law.<sup>47</sup> Table 1 (in the introduction) shows that creditors have a very

<sup>47</sup>Other factors not treated in this paper also contributed to the state of the credit market, including poor competition in the banking sector, high yield of treasury bills, and high banking costs.

low level of protection in Brazil, even when compared with the Latin American average. This characteristic reduces creditors' expected returns in insolvency states, which raises the interest rate spread and inhibits the supply of credit. The goals-of-insolvency index suggests that the bankruptcy procedure is very inefficient. It is long and costly; it rarely achieves an efficient outcome; it reduces the return in bankruptcy states; and it raises the cost of capital. Creditors' recovery rate in the case of bankruptcy is a mere U.S.\$0.002 on the dollar in Brazil, while the average of Latin American and OECD countries is U.S.\$0.26 and U.S.\$0.72, respectively.

The recent reform aims to improve both creditors' protection and the efficiency of the insolvency procedure, with potential positive effects on the credit market and on the economic efficiency of productive factors. The new law improves on existing legislation by integrating the insolvency system into the country's broader legal and commercial systems, providing an option to reorganize in or out of court, and striking a reasonable balance between liquidation and reorganization. It should also significantly improve the flexibility of the insolvency legal system by allowing the conversion of recuperation proceeding in liquidation, establishing a period in which debtors can apply for rehabilitation in response to a liquidation proceeding filed against them, and introducing a new out-of-court reorganization system for prepackaged restructuring plans.

The new liquidation procedure introduced six key changes. First, labor credit is limited to an amount equaling 150 minimum wages. Second, secured credit is given priority over tax credit. Third, unsecured credit is given priority above some of the tax credit. Fourth, the firm is sold (preferably as a whole) before the creditors' list is constituted; this speeds up the process and increases the value of the bankruptcy state. Fifth, tax, labor, and other liabilities are no longer transferred to the buyer of a property sold in liquidation. Finally, any new credit extended during the reorganization process is given first priority in the event of liquidation.



The first three changes have several expected effects on the life of firms. In the period preceding financial distress, these changes should cause a reduction of the cost of capital (proposition 2), an expansion of both the credit market and the set of socially efficient projects that will be financed (proposition 4), and a reduction of the underinvestment in effort, which is exacerbated when the bankruptcy system gives priority to tax or labor claims over creditors' claims (proposition 7). In the period following financial distress, the portion of insolvent firms will probably be reduced because the investment in effort increases and the aggregate gambling and delay effects are diminished (although the individual effects remain constant). The fourth and fifth changes, in turn, can be expected to increase the value of firms in bankruptcy states. The more creditors expect to receive in the insolvency state, the less they will require firms to pay in the solvency state, thus reducing the cost of capital (proposition 1). The fifth change will also speed up the process of putting the capital of liquidated firms to more efficient use. Finally, the sixth change reduces the indirect costs of the reorganization procedure. This should make potential buyers more willing to deal with the company and less likely to demand especially favorable terms than was the case under the former bankruptcy law. This factor tends to increase creditors' returns in the insolvency state, as well as the chance of success in reorganization.

All these changes work to raise both measures of bankruptcy efficiency. The first and second improve secured creditors' protection, while fourth, fifth, and sixth lower costs and improve the goals of insolvency.

Brazil's new reorganization procedure was inspired by Chapter 11 of the U.S. bankruptcy code. Whereas the previous law did not permit any renegotiation between the interested parties and only a few of parties were entitled to recovery of their assets, now managers make a sweeping proposal for recuperation that must be accepted by workers, secured creditors, and unsecured creditors (including trade creditors). Creditors play a more significant role in the procedure than previously, including negotiating and voting for the reorganization plan. The new law introduced two changes to increase the chance of a successful reorganization.

First, firms are given an automatic stay of 180 days, during which creditors cannot seize any of the firm's goods, even those given as collateral. The goal of this clause is to not disturb the firms' activities while management develops a proposal. Second, credit that is given to a reorganizing firm in the post-bankruptcy period has priority over older credits in the event of liquidation (the sixth point, above). This change seeks to motivate creditors to make new loans at better terms and to reduce the indirect cost of insolvency. These changes should help economically efficient firms recover, thereby improving the balance between liquidation and reorganization and reducing filtering failure (type I errors). Attaining a balance between the two types of bankruptcy procedure promotes a more efficient allocation of the productive factors by saving economically efficient firms that are suffering from financial distress and transferring the assets of economically inefficient firms to more efficient use.

The new reorganization procedure also introduces the possibility of APR violations. As discussed earlier, such violations give managers the incentive to make more efficient decisions when the firm is in financial distress, which reduces the perverse gambling and delay effects. On the other hand, this violation reduces managers' incentives to put in effort during the earlier stages of a firm's life. The aggregated result would therefore be ambiguous if this were the only change in the law. However, several modifications in liquidation and reorganization procedures should reduce the cost of capital for firms in the economy. This widens the gap between the returns in solvency and insolvency states, producing a positive final effect on managers' effort.<sup>48</sup> The aggregate cost of gambling and delay effects should thus be reduced.

The new law also created an extrajudicial procedure that is very important in Brazil because it saves high court costs. The out-of-court reorganization is a prepackaged mechanism, in which the majority imposes its decision on the minority. The private renegotiation

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<sup>48</sup>Let  $v_{solv}$  and  $F$  be the prereform values of firm's return and creditors' payment in solvency states,  $v_{solv}$  and  $F^R$  be the postreform values, and  $l$  the amount that managers gain with APR violations. If changes in bankruptcy law are such that  $v_{solv} - F^R - l > v_{solv} - F$  (where  $F^R + l < F$ ), then  $p'(e) = 1/(v - F) > 1/(v - F^R - l) = p'(e^R)$ , and therefore  $e^R > e$ . In other words, given these changes the manager's effort is stronger than in the prereform stage.

between groups of creditors and debtors avoids several losses during the firm's rehabilitation that are incurred in cases of an open renegotiation procedure.

Fraud in bankruptcy is another key issue addressed in the new law. The first, second, and third changes to liquidation cited above (that is, limiting labor credit and prioritizing secured credit above tax credit and unsecured credit above some tax credit), as well as the heightened role of creditors in reorganization, provide incentives against fraud in the bankruptcy procedure. The limitation on labor credit (up to 150 minimum wages) reduces the possibility that a manager will try to cheat the law by creating jobs for friends so as to receive payments from the failing firm. Giving secured credit a higher priority than tax and labor claims in a way to increase creditors' recovery in case of bankruptcy as well as the important role of creditors in reorganization raises their incentive to monitor the bankruptcy process, mitigating fraudulent actions. The old law contained several grounds for indictment for fraud, but they were not cumulative and each one carried a maximum two-year penalty. Since the judicial process was very slow, most penalties were prescribed, and there was always the possibility of no punishment at all. Under the new law, the two years of penalty are cumulative and the judicial process is accelerated, so the cost of fraud is expected to increase considerably. Another important change in the new law is that all fraud cases are remitted directly to the procedures of general criminal law, which is much more punitive than the special bankruptcy crime law. Moreover, since private creditors expect to receive more under the new law, they will be watching the judicial procedures of bankruptcy closely, and they will most likely be important allies in enforcing fraud penalty.

### **3.5.3. The Relevance of the Judiciary**

The judiciary plays a fundamental role in the fulfillment of the law. If rules and regulations are not properly enforced, the law will not attain its full objectives even if it is well designed. We use two measures to quantify the quality of the courts. The first is the quality of enforcement, captured by the number of days the court takes to solve a payment dispute. The second is

the rule of law, which rates the country's tradition of law and order. Table 5 indicates that under both measures, the quality of the Brazilian judiciary is inferior to the mean in Latin America and the Caribbean. Contracts take longer to be enforced, and the country has a weak tradition of fulfilling the law.

**Table 5: Judiciary Quality Indicators**

<i>Country or region</i>	<i>Quality of enforcement (days)</i>	<i>Rule of law [0, 6]</i>
Brazil	566	1.50
Latin American and the Caribbean	440	2.35
OECD	230	5.33

Source: World Bank, *Doing Business* (2004); PRS Group, *International Country Risky Guide* (2004).

Castelar's careful study of the Brazilian judiciary offers possible explanations for the low quality of the institution.<sup>49</sup> Castelar interviewed entrepreneurs and magistrates to ask their opinion of the process. Entrepreneurs evaluate judicial agility as bad or worse in 91 percent of the cases, while even magistrates themselves evaluate it as normal or worse in 86.4 percent of the cases. The inability to forecast judiciary decisions was also identified as an important feature of the Brazilian judiciary. Asked when magistrates' decisions reflect their political views, only 22 percent answered rarely or never. Finally, magistrates were asked how they would rule in the case of a conflict between compliance with contracts and the interests of less privileged social segments: only 19.7 percent answered that they would follow contracts. Castelar's study thus reveals a judicial environment that is unfavorable to credit, and it helps explain why expectations of recovery are low when a firm goes bankrupt and courts become involved in the process.

Lawmakers are in the process of improving the Brazilian judiciary. The congress recently approved a law that establishes the higher court's decision as binding. That is, if a superior magistrate's court makes a certain decision, a lower court cannot decide differently in similar cases. This change reduces the burden of the judiciary and shortens the processing of cases. The congress is also currently reviewing a law that would change the procedural code to

<sup>49</sup>Castelar (2003).

eliminate several procedures that contribute to court delays. Both changes should contribute to raising the efficiency of the judiciary and developing the credit market.

### 3.6. Conclusion

A bankruptcy system should seek ex post and ex ante efficiency. Ex post efficiency means that the procedure maximizes the total value of the firm's assets, increasing creditors' returns in states of insolvency and consequently lowering the cost of capital. Ex ante efficiency guarantees the optimal division of value in case of bankruptcy. Violations of the absolute priority rule have desirable effects in situations of financial distress by providing incentives to reduce delays and investments in inefficient risky projects. But they also have negative effects in the period preceding financial distress by reducing managers' incentives to invest in effort. The effect on the cost of capital is ambiguous. Whether APR violations are optimal thus depends on the country's particular characteristics, which will determine which effect is most relevant. Giving creditors' claims priority over tax or labor claims proves to be highly efficient because of the significant positive impact on both the cost of capital and managers' effort, with no negative impact. Moreover, it gives creditors the incentive to monitor the actions of managers during bankruptcy, which helps prevent fraud.

Our empirical analysis reveals that Latin American and Caribbean countries have a poor bankruptcy system, with problems on both measures of procedural quality. Inefficient procedures do not maximize the firms' value, which significantly reduces the creditors' recovery rate and increases the cost of capital. In addition, creditor protection is the lowest in the world. This shrinks the supply of credit and exacerbates the negative impact on the credit market.

In response to the severe inefficiency of bankruptcy laws in Latin America and the Caribbean, many governments have initiated efforts to reform the bankruptcy system. In this paper we focus on the Brazilian case as the most recent and arguably most ambitious reform in the region. The new law aims to reduce the inefficiency of the bankruptcy procedure,

making it less costly and shorter, and to provide a good balance between liquidation and reorganization. It also seeks to increase both creditor protection and the role of creditors in the insolvency procedure. We conclude that improvements in liquidation and reorganization procedures, as well as the creation of an extrajudicial procedure, should have a strong positive impact on the Brazilian credit market. Additional efforts are underway to improve the performance of the Brazilian courts, which have contributed to creating an environment that is unfavorable to credit.

These changes in Brazil and elsewhere tend to provide a more attractive business environment to entrepreneurs. Based on our theoretical and empirical findings, we expect the reform to have several consequences. The theoretical model suggests that gains in procedural efficiency (which increase a firm's value in insolvency) and the high priority given to creditors will be reflected in a lower cost of capital to firms and a larger set of financed projects. This, in turn, will help promote entrepreneurship through the creation of new firms and investments, thus fostering economic growth.

The changes should also reduce moral hazard effects related to managers' effort, which will help keep companies out of financial difficulties. Efficiency in the allocation of resources should also improve: the new reorganization procedure provides a good balance with liquidation, then economically efficient firms will be able to continue their operations, while economically inefficient firms will be shut down and their assets moved to more efficient businesses. In short, the Brazilian bankruptcy law reform should thus have significant positive consequences for both the credit market and general economic efficiency.

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### 3.7. Appendix: Brazilian Bankruptcy Reform

This appendix represents the comments of Aloisio Araujo on his personal participation in Brazilian bankruptcy reform. Araujo worked as a member of a group of lawyers, economists, and international consultants, who were brought together by the Central Bank to study the new bankruptcy law.

#### 3.7.1. History

The last Brazilian bankruptcy law dated from the 1940s and as a result was highly fragmented and inefficient. In 1993 the Executive Office drafted a new law to modernize the country’s insolvency procedures. Most specialists reacted with skepticism, however, because the initial draft tried to save firms at all costs. This set off a long process of revision and negotiation, which ultimately led to the passing of new bankruptcy legislation in June 2005.

In 2001 the president of the Central Bank, Arminio Fraga Neto, and the director of economic studies, Sergio Werlang, invited me to participate in a group to study the new law from both the economic and juridical viewpoints. The group’s first decision was whether to create a new law, which would require an enormous effort in terms of both designing a procedure with the correct economic incentives and convincing legislators to accept it, or

simply to amend the existing law by eliminating its main distortions. Those in favor of amending the old law argued, first, that it contained terminology and concepts that were already in the domain of courts all over Brazil, which was particularly relevant since business bankruptcy falls under state rather than federal domain, and, second, that the draft of the new law was very badly designed in terms of its economic impact. This position had the support of important lawyers like Luis Bulhões Pedreira, who has a strong reputation for having written a corporate law in the 1960s, which at the time was quite advanced in terms of economic reasoning. It was clear, however, that congress would only pass a law that preserved firms, so the decision was made (correctly, in my view) that the group would pursue a new law. This would be a difficult task, considering that the country political and juridical institutions upheld a strong anticreditor bias, reflecting the high real interest of the last few years, the much higher returns on capital, and a bad income distribution.

Having reached this decision, the group in charge of the project initiated a long process of working and bargaining with the Brazilian congress, in particular with the staff of Congressman Osvaldo Biolchi, who was the author of the original draft and who played an important role in the process until the end. However, the administration did not put the project to a vote because it was focused on other priorities, such as the independence of the Central Bank.

In the new government, the project was given high priority owing to the positive influence of Marcos Lisboa, the Secretary of Political Economy in the Finance Ministry. The lower house approved the law in late 2003. It contained some very sound principles, such as strengthening creditors' opinions on reorganization and eliminating some of the fiscal priorities in the sale of assets, but some very important elements were missing.

At that point many economists, executives, and lawyers thought it would be better not to have a new law, since it would create even more uncertainty for creditors than the old one. Fortunately, the senate presented a much more positive perspective for the new law. I happen to be a childhood friend of an influential Senator of the political opposition, Tasso Jereissati,

who helped me gain access to key Senators in the matter, including Lucia Vania, Ramis Tebet (the head of the senate's economic commission), and Aloisio Mercadante (the government's leader in the senate). I found a very positive environment for discussing this important law, which led to many improvements. For example, the senate withdrew the fiscal priority and limited the labor priority in liquidation. Also, at considerably high cost, the senate allowed for a prepackaged extrajudicial procedure along the lines of the U.S. procedure. The final law was approved in June 2005. The challenge now is how the Judiciary is going to interpret the new law.

### **3.7.2. The Previous Situation and the Main Changes**

The crucial result of the old bankruptcy law was complete disorder in the Brazilian credit market. Total credit was scarce, at just 26 percent of GDP.<sup>50</sup> Banks were given low priority in cases of liquidation, so they would reduce credit further if a firm showed any signs of bad economic health, given that their recovery rate was so low.<sup>51</sup> Firms would then finance themselves by delaying their tax payments. Tax authorities had priority in cases of liquidation, which would scare banks even further, and so on. Credit to many types of firms simply collapsed.

Under the old system, banks did not have incentives to liquidate firms, even there are no prospects for recovery. On the other hand, few firms are able to recover successfully. This situation results directly from the high priority of taxes in liquidation, combined with the Brazilian tax structure, which relies too much on indirect taxes. If corporate taxes were more important in the tax structure, firms would not accumulate such a large tax debt: firms in financial distress do not have profits. Hence, banks would not fear liquidation so much, increasing the banks' incentive and improving the recovery rate in cases of bankruptcy.

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<sup>50</sup>Data from Central Bank of Brazil (2004).

<sup>51</sup>See the data in the previous section.

Certain changes seemed impossible at the beginning of the process five years ago, but today there are several reasons for optimism. The modifications obtained in the final law will introduce incentive mechanisms that will enable the development of credit markets in Brazil. The key changes obtained in the area of liquidation included limits on labor credits, prioritizing secured credit above tax credit, and prioritizing unsecured credit above some tax credit. In addition, firms will be sold (preferably as a whole) before the creditors' list is constituted; this will speed up the liquidation process and increase the value of the bankruptcy state. Finally, any new credit given in the reorganization step will be given first priority in liquidation.

In reorganization:

The most important changes in the area of reorganization were inspired by Chapter 11 of the U.S. bankruptcy code. Despite some well-known problems with this procedure, it is far better than the alternatives that were proposed initially, in which the goal was to try to save all firms at all costs. Under the approved law, creditors will have to vote for the reorganization plan, but the alternative of a court-appointed new manager was rejected. Brazil's simplified version of Chapter 11 thus has some advantages in terms of simplifying the court procedure, but it weakens the credit aspects by making heterogeneous creditors vote together.

The adoption of an extrajudicial procedure is very important in Brazil since it saves high court costs. Finally, the former provision on the inheritance of tax debt essentially eliminated any possibility for distressed firms to sell their assets, since the new owner would inherit all the labor and tax liabilities, even the hidden ones. Eliminating this provision will speed up the process of putting firms' capital of firms to new uses, creating new incentives for mergers and acquisitions.

### **3.7.3. What Ideas Failed in the Brazilian Experience?**

When I first started working on the new law, I thought it would be a good idea to have a very simple procedure that would strengthen creditors' rights, save on court costs, and at

the same time avoid a possible bias on the part of the judges.<sup>52</sup> One possibility was to follow the suggestions of Bebchuck and Hart and others, who argue for simply giving the financially distressed firm to the senior creditor and allowing the more junior creditors to buy from the senior for the price of their credit.<sup>53</sup> Although ingenious, this idea received much opposition from lawyers and politicians in Brazil. Lawyers alleged that the rights of the parties involved would not be fully preserved because the court does not have a prominent role. In general, the justice culture is against any summary resolution. On the political front, the congress had a bias of the firms' owners. So I had to give it up. Another idea was to follow the English model, in which the in favor creditor has considerable power and no effort is made to save firms as a whole. This could be important in countries that are reluctant to close firms, even those without sound economic prospects. However, the Brazilian congress was determined to pass a law that emphasizes saving firms, and Chapter 11 fulfills this role. At least it gives creditors a strong role in the process, although it may be too complex for a developing country.

One problem with the Brazilian law is that the judge, rather than the creditors, appoints the clerk in charge of liquidation. Another problem is the treatment of tax liabilities under reorganization. As mentioned, distressed firms in Brazil tend to have many tax liabilities. The solution that I proposed was for the government to auction the tax liabilities of firms that asked for reorganization. The auction would attract many new specialists interested in reorganizing the firm, and the owners would avoid losing control of the firm as a result of their excessive tax liabilities. This solution was scrapped for fear that it might be unconstitutional. The solution adopted was to grant an automatic reorganization of the tax debt over eight years. This could give firms the incentive to keep accumulating tax debt and to ask for reorganization within five years. It could also be very bad for credit.

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<sup>52</sup>This last point is very well documented in Castelar and Cabral (2001).

<sup>53</sup>Bebchuck (1988); Hart and others (1997).

### 3.7.4. Policy Lessons

All the main distortions that I found are probably very specific to Brazil, as I have never seen them mentioned in the international literature. The first distortion is the priority given to taxes over secured credit. Araujo and Lundberg show that only four countries out of a sample of thirty-five share this unfortunate property.<sup>54</sup> This was an important argument in convincing the senators to change the law. The fact that the tax authorities were only able to collect less than four million dollars in a recent year makes one wonder why there was so much fighting over this, although corruption could be an explanation. An equally distortional aspect of the old law was the labor and tax inheritance provision. Again, when the distortion was carefully explained by a neutral party, congressmen understood the economic argument and voted to create the right incentive, but this took time. Compared with this type of distortion, the usual debate about bankruptcy seems far less important. Poor countries, in particular, tend to create very distortional institutions, sometimes in an attempt to solve other distortions. In this case, however, I think the distortions were created simply to avoid tax evasion, rather than to benefit any special group.

Another lesson is that it is sensible to separate the law itself from the judiciary, although the two issues are related. For example, it is good to have a simpler – albeit imperfect – law in a less developed country. It is a big mistake to think the entire credit problem is due to the prodebtor bias of the judiciary. The very low recovery rates and the very long liquidation period, as shown in World Bank data for Brazil, are largely due to creditors' lack of interest in a liquidation procedure from which they are not going to benefit. The change in the priority in liquidation is bound to change the whole governance of liquidation. The judiciary still plays a very important role, however. For example, many judges are considering not calling for liquidation even if creditors vote not to accept the plan to reorganize the firm, although

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<sup>54</sup>Araujo and Lundberg (2003, table A).

the new Brazilian legislation does not provide for the so-called cram down in Chapter 11 of the U.S. code.<sup>55</sup>

Although countries do learn from one another, each country has its own distortions to resolve. Brazil, for example, is in the top 40 percent with regard to low corruption but in the bottom 5 percent with respect to credit, according to the World Bank. The reforms have to take into consideration what the country has already achieved. They should be designed, as in Brazil, by a multidisciplinary group of lawyers, judges, and economists, mainly microeconomists who have an intuition of the incentives of the several parties involved. The main goal should be a better system, since there is no agreement among economists about what constitutes an optimal bankruptcy law.

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<sup>55</sup>The cram down is a procedure whereby reorganization can be adopted by the bankruptcy judge despite being voted down by one or more classes of creditors.

Table A: Priorities in Bankruptcy Laws, Selected Countries

Countries	Priorities			
	1	2	3	4
Australia	Secured Credit	Post-Bankruptcy Credit	Wages	
Austria	Secured Credit	Post-Bankruptcy Credit		
Belgium	Secured Credit	Post-Bankruptcy Credit	Tax and and Social Welfare claims	
Bermudes	Secured Credit	Wages and Assignments	Post-Bankruptcy Credit	Tax claims
Brazil	Labor claims	Tax Claims	Post-Bankruptcy Credit	Secured Credit
Bulgaria	Secured Credit	Post-Bankruptcy Credit		
Canada	Secured Credit	Post-Bankruptcy Credit	Wages (bounded)	Tax claims
China	Secured Credit	Post-Bankruptcy Credit	Labor claims	Tax claims
Czech Republic	Secured Credit	Post-Bankruptcy Credit	Labor claims	
Estonian	Post-Bankruptcy Credit	Secured Credit	Labor claims	Tax claims
Finland	Secured Credit	Post-Bankruptcy Credit		
France	Wages	Post-Bankruptcy Credit	Secured Credit	
Germany	Secured Credit	Post-Bankruptcy Credit		
Hong Kong	Post-Bankruptcy Credit	Secured Credit	Labor claims	Tax claims
Hungary	Post-Bankruptcy Credit	Secured Credit	Wages	Tax claims
Ireland	Secured Credit	Tax Claims (bounded)	Labor claims	
Israel	Secured Credit	Post-Bankruptcy Credit	Labor claims (bounded)	Tax claims
Italy	Post-Bankruptcy Credit	Tax and Labor claims	Secured Credit	
Japan	Secured Credit	Post-Bankruptcy Credit	Labor claims	
Korea	Secured Credit	Post-Bankruptcy Credit		
Malaysia	Secured Credit	Post-Bankruptcy Credit	Labor claims	Tax claims
Netherlands	Secured Credit	Post-Bankruptcy Credit	Tax claims	Labor claims
Poland	Tax claims	Post-Bankruptcy Credit	Secured Credit	
Portugal	Secured Credit	Labor Claims	Post-Bankruptcy Credit	Tax claims
Russia	Post-Bankruptcy Credit	Labor Claims	Secured Credit	Tax claims
Scotland	Secured Credit	Post-Bankruptcy Credit	Tax claims	Labor claims
Singapore	Secured Credit	Post-Bankruptcy Credit	Labor claims (bounded)	
Slovak Republic	Secured Credit	Post-Bankruptcy Credit		
Spain	Wages (last 30 days and maximum of 2 minimum wages)	Tax Claims	Secured Credit	
Sweden	Post-Bankruptcy Credit	Secured Credit	Tax claims	labor claims
Switzerland	Secured Credit	Post-Bankruptcy Credit	Labor claims (bounded)	
Tailand	Post-Bankruptcy Credit	Secured Credit	Labor claims	
UK	Secured Credit	Post-Bankruptcy Credit	Tax and and Social Welfare claims	Labor claims
United States	Secured Credit	Post-Bankruptcy Credit	Labor claims (bounded)	Tax claims
Vietnam	Post-Bankruptcy Credit	Secured Credit	Labor claims	Tax claims



## CHAPTER 4

# **Bankruptcy Law and Credit Market: A General-Equilibrium**

## **Approach<sup>1</sup>**

### **Abstract**

This study has as its main objective to analyze the best bankruptcy procedure considering the conflict of interests between managers, secured creditors and trade creditors. Such trade-off is strictly connected with industry and countries characteristics, which is also relevant to the design of the bankruptcy law. Using simulation methods we show that for liquidation procedure that does not depreciates the failed assets too much, bankruptcy-liquidation produces better economic results for sectors intensive in physical capital. As the depreciation in liquidation increases and/or the industry sectors are less intensive in physical capital, the availability of reorganization produces better economic results. Using data of 44 countries, our results points that approximately 60% of the countries in the sample apply a procedure aligned with our suggestions.

### **4.1. Introduction**

The structure of creditors-debtor relationship and the design of bankruptcy laws has received special care from scholars, practitioners and lawmakers since the debt has usually been a major source of financing for firms. When lawmakers design a bankruptcy law that is best for their specific economy, they cannot just resort to existing theories in economics and corporate finance because countries differ in their economic environments and usually, these

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<sup>1</sup>This article was jointly made with Aloisio Araujo. I would like to thank John Geanakoplos, Luis Henrique Braidó, Carlos Eugênio da Costa and Ana Carla Costa for their helpful comments as well as seminar participants at the VII Latin-American Workshop in Economic Theory at Rio de Janeiro.

theories do not capture such cross-country differences. Understanding these differences, we can search the optimal bankruptcy law for particular countries.

In this study, we analyze how the optimal bankruptcy laws depend on the specific industries and countries characteristics, and propose the best law for different countries based on their particularities.

A key relationship, common to all countries, is between entrepreneurs who needs to raise funds to buy the inputs for the firm and secured and trade creditors that provide such funds. The need of both creditors creates a conflict of interests between them and consequently a trade-off – that depends from the country’s characteristics – emerges. The intuition behind this trade-off is the following: for countries where the industrial sectors intensive in physical capital predominates, the bankruptcy should be pro-secured creditors since they supply the bigger share of the credit. This way, the existing mechanisms of some bankruptcy laws that incentive reorganization like the automatic stay of the firms’ collateral and no restriction to managers entering on reorganization should not be optimal. Then, the bankruptcy law that provides just bankruptcy-liquidation would improve the aggregated credit-market conditions. On the other hand, for countries predominating industries intensive in variable input the bankruptcy law should be pro-debtors, inducing the reorganization since it increases the expected return of trade creditors and improves their credit conditions.<sup>2</sup> Since the share of trade creditors is bigger than secured creditors, even worsening the secured credit situation, the aggregated conditions of credit market will improve.

Another important country’s characteristic that must be considered in the design of the optimal bankruptcy law is the cost (direct and indirect) of liquidation and reorganization procedures. The direct costs, that considers bankruptcy filing fees, expenses with trustee, accountant, debtors’ attorney and unsecured creditors’ committee, consumes a small share of the debtors’ total assets.<sup>3</sup> Besides the literature is divided in pointing the more expensive

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<sup>2</sup>With reorganization trade creditors have one more chance to be paid.

<sup>3</sup>See LoPucki and Doherty (2004).

procedure, at least inside the U.S..<sup>4</sup> However, when we consider the indirect costs, the liquidation procedure seems to work worse at retaining value throughout the bankruptcy process, imposing a severe burden on the insolvent firms' assets.<sup>5</sup> The explanation for this evidence comes from distinct sources. First, is that when financial markets are imperfect, which is very common in developing countries, the best managers may not be able to raise the necessary cash to buy the firm. The firm may therefore be inefficiently dismantled and its assets sold cheaply. Another explanation for the loss of value in liquidation is that when a firm in financial distress needs to sell its assets, its industry peers are likely to be experiencing problems themselves, forcing the trustee to sell the assets below their potential value.<sup>6</sup> As this difference between the procedures' costs varies, the optimal bankruptcy should vary too, aiming at minimizing such burden.

For a social planner which designs a procedure that aims to provide the best conditions in the credit market, we will show that an optimal bankruptcy law has to address the following issues:<sup>7</sup>

- (1) It should facilitate liquidation when the costs of liquidation relative to reorganization is small and the industry sector is more capital intensive;
- (2) It should facilitate reorganization as the costs of liquidation relative to reorganization increases and the industry sector became more input variable intensive.

The theoretical framework will be drawn upon the general equilibrium framework. Corporations take debts for several different reasons. One important characteristic of this act is that such firms wish to repay their debts with their future gains. But, there is always the possibility, for some reason, of no fulfillment of such a repayment promise. Also, since in

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<sup>4</sup>For example, Altman (1984), Hotchkiss (1995), and Weiss and Wruck (1998), among others, consider reorganization costs to be high, whereas Alderson and Betker (1995), Gilson (1997), and Maksimovic and Phillips (1998) consider costs to be low and Bris et al. (2006) consider that the difference on costs are not statistically significant.

<sup>5</sup>See Bris et al. (2006).

<sup>6</sup>See Shleifer and Vishny (1992).

<sup>7</sup>Dubey, Geanakoplos and Shubik (2005) show, using a general equilibrium model with incomplete markets and default, that for a economy with one good the maximal credit (risk sharing) traduces itself in a maximum welfare.

practice debt contracts do not specify in which state of nature the promise should be fulfilled, i.e. they are state-independent, we broach the problem by developing a general equilibrium model with incomplete markets and default.

We solve a general equilibrium problem with three agents – manager/owner who runs the firm; secured creditor who finance the firm’s purchase for hard assets, where the same assets are used as collateral for such debt contracts; and trade creditors (or unsecured creditors), who sell the variable input on credit. Simulating for a range of parameters that describe the characteristics of the countries (bankruptcy costs) and industry sectors (the portion of physical and variable inputs) we find:

- a menu of bankruptcy law that maximizes the amount of credit in each sector
- the optimal bankruptcy law for the economy as a whole, considering the share of the value added of each sector and its best bankruptcy procedure.

After the simulation for a range of parameters, we fix the bankruptcy-liquidation costs in the level estimated by the U.S. to find the best bankruptcy procedure for a sample of 44 countries. Our results points that approximately 61% of the countries in the sample apply a procedure aligned with our suggestions. Also, they suggest that 80% of the countries (35 of 44) should apply a pro-reorganization bankruptcy law.

The remainder of the article is organized as follows: section 2 discusses the literature review; section 3 discusses the corporate bankruptcy law; section 4 presents the theoretical model; section 5 presents the simulation results; and section 6 concludes.

## **4.2. Literature Review**

Our paper belongs to the body of the literature on the designs of bankruptcy laws. The early economists consider bankruptcy laws for firms that are already in default, focusing on the deviations from the absolute priority rule (APR), and on the costs associated with bargaining in the reorganization procedure. Some economic theorists favored a market auction

approach to cutting the costs implicit in reorganization.<sup>8</sup> Specifically, a state official would auction insolvent firms to the market, free of current claims, and then distribute the proceeds to creditors according to absolute priority rules. On the other hand, Bebchuk argues that reorganization can capture a greater value than liquidation, especially when the company's assets are worth much more as a going concern than if sold piecemeal and if there are few or no buyers with both accurate information about the company and sufficient resources to acquire it. He therefore proposes an options approach that homogenizes the interests of the holders and follows the absolute priority rule, creating a reorganization procedure without the burden of APR violations or bargaining costs.

Bebchuk's idea receives significant support in subsequent literature. For example, Aghion, Hart, and Moore use it as the basis for a bankruptcy reform proposal that includes an auction mechanism, and Hart and others adapt it to develop a new procedure using multiple auctions.<sup>9</sup> These procedures also generated their share of critical or skeptical reactions. The criticism emphasizes that the lack of liquidity (since the firms are in financial distress) makes it impossible for shareholders to exercise their options; and the skepticism centers on the complexity of the mechanisms, which makes it difficult to implement the proposals of Aghion, Hart, and Moore and Hart and others.

Early theorists thus held that bankruptcy systems should follow absolute priority strictly. This requires secured creditors to be repaid in the order that the firms' contracts determine, which means that they have priority over other creditors, as trade creditors. The rule implies that equity holders should receive nothing, because the residual claim on an insolvent firm is worth nothing.

Modern theory relates the results of a bankruptcy procedure to the early stages in the life of the borrowing firm. An ex post efficient bankruptcy system maximizes the payoff that creditors receive from insolvent firms. In the borrowing stage, a competitive credit

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<sup>8</sup>See Baird (1986) and Jensen (1991).

<sup>9</sup>Aghion, Hart, and Moore (1992); Hart and others (1997).

market would reduce the amounts that lenders can require solvent firms to repay when the lenders' expected insolvency payoffs increase. Thus, interest rates fall as the efficiency of the applicable bankruptcy system increases. In contrast, the ex ante efficiency of the bankruptcy system is related to the optimal division of the firm's total value. Substantial research addresses the issue of the reorganization procedure through violations of the absolute priority rule (APR), arguing that the ex ante effect of deviations from the rule are actually beneficial. In particular, this line of research shows that APR deviations encourage desirable ex ante investments in firm-specific human capital; that they facilitate the transfer of information to creditors and improve the timing of decisions to file for bankruptcy, to liquidate, or to recapitalize; and that they discourage excessive risk-taking by financially distressed firms.<sup>10</sup> Bebchuk shows that reorganization that allows ex post APR deviations also have negative effects on ex ante decisions made by shareholders. He argues that such deviations have an adverse effect on ex ante management decisions made prior to the onset of financial distress. The presence of APR deviations aggravates the moral hazard problem, but the final effect of such deviations is inconclusive.

This paper also relates the bankruptcy design with the early stages of firms life, but in contrast, we explore the trade-off between betors and creditors and also between different classes of creditors: secured and unsecured creditors (or trade creditors). The main goal is to analyze the use of different procedures considering some countries' particularities as productive structure and the bankruptcy costs.

### 4.3. Corporate Bankruptcy Law

#### *Liquidation*

The liquidation procedure determines the sale of firm's assets when it is in financial distress (see figure 1).<sup>11</sup> This can involve either the sale of the whole business or its productive

<sup>10</sup>Berkovitch, Israel, and Zender (1997); Povel (1999); Berkovitch and Israel (1999); Eberhart and Senbet (1993).

<sup>11</sup>A firm is financially distressed or insolvent when it can no longer meet its debt obligations with another firm or institution.

units or the piecemeal sale of its assets, depending on demand. The absolute priority rule determines how the proceeds of sale are divided among the claimants. It specifies what claims are paid in full according to an order defined by bankruptcy law of each country. Usually, for secured creditors is given high priority since they have bargained with the firm for the right to claim a particular asset or its value if the firm files for bankruptcy.

When capital markets are imperfect, the best managers may not be able to raise the cash necessary to buy the firm. The firm may be inefficiently dismantled, and its assets sold off cheaply causing the called "loss of value in liquidation". Reorganization provides a good alternative for countries with weak capital markets. Another explanation for the loss of value in liquidation is that when a firm in financial distress needs to sell its assets, its industry peers are likely to be experiencing problems themselves, forcing the trustee to sell the assets below their potential value<sup>12</sup>. Hence, if assets are very firm-specific and the correlation of returns across firms is high, reorganization is likely to be preferable to liquidation as way to maximize firm value after insolvency.

### *Reorganization*

In reorganization the firm has one more chance of success since it continues to operate (see figure 2). Some features determined by the bankruptcy law are capable to make the reorganization more effective.

The first one is the so-called *automatic stay*. The choice for the reorganization produces a conflict between the secured creditors' right to claim their collateral and the goal of reorganizing the firm. To be successful, the firm must retain assets, which are crucial to its operations. At the same time, secured creditors often wish to claim these assets. Some countries, such as the United States,<sup>13</sup> resolve this conflict in the firm's favor by applying an automatic stay to secured creditors, thereby making the reorganization process more appealing. Not all countries have this degree of protection, and some – including Germany and the United

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<sup>12</sup>See Shleifer and Vishny (1992).

<sup>13</sup>Thirty-eight percent in a sample of 133 countries apply the automatic stay, while sixty-two percent does not apply it.

Kingdom – do not have it at all. This weakens or even eliminates the possibility of reorganization.<sup>14</sup> The other one is the method used in the choice between both procedures. Some countries (like Germany, France, and England) give the exclusive control of the proceeding to an outside official, who makes the initial decision of whether to liquidate the firm or to keep it operating. Other countries (including the United States) give managers the right to choose between filing for bankruptcy liquidation or reorganization, inducing a higher amount of reorganization procedures.

The payoff patterns under liquidation versus reorganization differ strongly. Under liquidation, secured creditors tend to receive full payoff while trade creditors the residuals, with equityholders receiving nothing at all. Under reorganization, since there is one more chance of success, each class of creditors and equity have positive expected return before the bankruptcy procedure begins.

#### 4.4. Theory: The General Equilibrium Approach

##### **Hypotheses**

##### *Agents*

Consider an economy with three different types of agents: manager/owner (firms), secured creditors (banks) and trade creditors (suppliers). The manager runs a firms where its production function depends of two types of inputs: fixed (ex: physical capital, that can be used as collateral) and variable (perishable). Banks finance the purchase of fixed inputs buying firm's assets using the fixed input as collateral. Suppliers provide the variable input to firms in exchange of firm's assets that promises a future payment. In case of bankruptcy, banks (or secured creditors) are preferential creditors and trade creditors (or unsecured creditors) are residual creditors.

##### *Goods and Assets*

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<sup>14</sup>For example, in UK approximately only 20% of bankruptcy firms do not go to liquidation and in Germany less than 1%. See Brouwer (2006).



There are three kinds of goods. Two of them are used as input for production (fixed and variable inputs), and the third good is the production output, that is used to pay the creditors. The fixed input can be used as collateral, but after the second period<sup>15</sup> it depreciates  $(1 - \delta)$ . The variable input is perishable, which means that can be used only in one production process,<sup>16</sup> and it cannot be used as collateral. There are two different assets in this economy. One asset is negotiated with banks, promising a payment of one unit of output, independent of the state of nature. If the firm files for bankruptcy, the bank has the highest priority or at least the right to get the collateral (physical capital). The other asset promises a payment, also unconditional from the state of nature, of one unit of output to trade creditors. If the firm files for bankruptcy the trade creditors that have residual claims receive the firm's leftovers.

#### *Endowment*

Banks and trade creditors own fixed and variable input respectively but no investment project, while managers own the risky project and some fixed input.

#### *Production function and preferences*

Each firm has a production function that requires both fixed and variable inputs to produce the output. Banks are risk-neutral, while trade creditors and managers are risk-averse.

#### *Investment Project*

Each firm purchases fixed and variable inputs (financed through asset selling) in the first moment. Then, the firm produces a random amount of output  $\eta f(K, V)$ , where  $\eta$  is a random variable (idiosyncratic shock),  $K$  and  $V$  are the amount of fixed and variable input invested in the project. There are  $S$  states of nature determining the productivity factor  $\eta$  that belongs

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<sup>15</sup>Thus, if the firm goes to bankruptcy in the first period,  $K$  does not depreciates. Otherwise, if the firm chooses reorganizaton, it depreciates at a rate  $(1 - \delta)$  at the end of the period.

<sup>16</sup>We consider the reorganization part of one production process.

to the set  $[\eta_1, \dots, \eta_S]$ , and therefore  $\eta_s \in [\eta_1, \dots, \eta_S] \forall s = 1, \dots, S$ . Each state of nature occurs with probability  $p_s$ , where  $p_s > 0 \forall s$  and  $\sum_s p_s = 1$ .

### *The Bankruptcy Cost*

The cost of bankruptcy (direct plus indirect costs) is represented by the vector (reorganization cost, liquidation cost) =  $(1, (1 - l))$ , where  $l \in (0, 1]$ , since the direct costs of both procedures are small and not too much different and the indirect costs in liquidation is bigger than in reorganization.<sup>17</sup> This way, the capital will be worth  $lK$  if the firm goes to liquidation and  $K$  if it is well succeed in reorganization.

Liquidation. There are two states mutually exclusives when the firms begins its operation: the non-financial distress state and the financial distress state. Under a bankruptcy system that works only with the liquidation procedure, when the firm enters in financial distress it will have its assets sold (see figure 1).

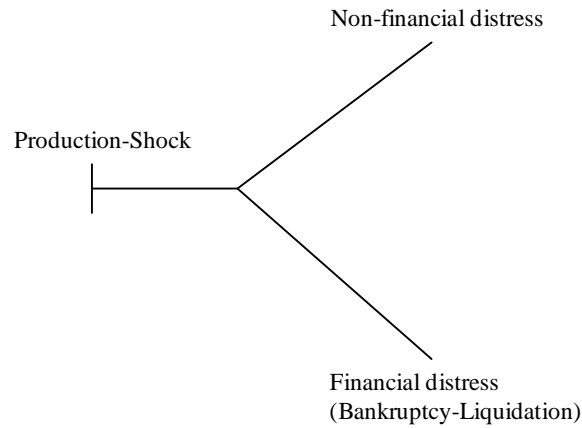


Figure 1: Scheme for Bankruptcy-liquidation

**Definition 1:** *The state of financial distress is the state in which  $\eta_s f(K + (1 - \tau)K_0, V) + K + (1 - \tau)K_0 - \theta_K^F - \theta_V^F < 0$ , and the state of non-financial distress is the state in which  $\eta_s f(K + (1 - \tau)K_0, V) + K + (1 - \tau)K_0 - \theta_K^F - \theta_V^F \geq 0$ .*

<sup>17</sup>See Bris et al. (2006).

In words we can say that a firm is in financial distress if it has more debts (liabilities) than total assets which might be available to pay the debtors.

Managers. Managers chose how much of fixed and variable input to buy and – if they own a positive amount of capital ( $K_0 > 0$ ) – how much of their capital to put in the firm (and, of course, how much to spend in risk-free assets with return of  $\phi$ ), looking to maximize their expected utility  $Eu(c)$ .

$$\begin{aligned} & \max_{\tau, K, V, \theta_K^F, \theta_V^F} \sum_{s=1}^S p_s [u(c_s)] \\ \text{s.t. } c_s &= \tau K_0 \phi + [\iota_s (\eta_s f(K + (1 - \tau)K_0, V) + K + (1 - \tau)K_0 - \theta_K^F - \theta_V^F) + \\ & (1 - \iota_s) (\eta_s f(K + (1 - \tau)K_0, V) + l(K + (1 - \tau)K_0) - \theta_K^F \rho_K - \theta_V^F \rho_V)] \\ K &= q_K \theta_K^F \\ V &= q_V \theta_V^F, \end{aligned}$$

where  $\iota_s = 1$  when  $\eta_s f(K + (1 - \tau)K_0, V) + (K + (1 - \tau)K_0) - \theta_K^F - \theta_V^F \geq 0$  and 0 otherwise,  $q_K$  and  $q_V$  are the assets prices,  $\theta_V^F$  and  $\theta_K^F$  are the amount of assets sold by the firm,  $l$  is the depreciation by financial distress,  $\rho_K = \min \left[ 1, \frac{\eta_s f(K + (1 - \tau)K_0, V) + l(K + (1 - \tau)K_0)}{\theta_K^F} \right]$  and  $\rho_V = \left( \frac{\eta_s f(K + (1 - \tau)K_0, V) + l(K + (1 - \tau)K_0) - \theta_K^F \min \left[ 1, \frac{\eta_s f(K + (1 - \tau)K_0, V) + l(K + (1 - \tau)K_0)}{\theta_K^F} \right]}{\theta_V^F} \right)$ .

Banks. Since Banks are risk-neutral we define their objective function as:

$$\max_{\varphi_K^B} \phi(\bar{K} - q_k \varphi_K^B) + \sum_{s=1}^S p_s (\iota_s \varphi_K^B + (1 - \iota_s) \varphi_K^B \rho_K).$$

Banks supply  $K$  for firms. The return of the risk-free asset (outside option) pays  $\phi$  for each unity of  $K$ . Since firms don't have any wealth they offer assets to banks in exchange of  $K$ . The asset is a promise of payment of 1 unit of output in all states of solvency, with preferential claims if bankruptcy occurs.

Trade Creditors. Trade creditors supply a specific good that serves as an input for firm's production. Since this type of creditors sell a specific good, not allowing to diversify risk, they are risk-averse.

$$\begin{aligned} \max_c u(c_0) + \beta \sum_{s=1}^S p_s u(c_s) \\ c_0 &= z(\bar{V} - q_V \varphi_V^T) \\ c_s &= \iota_s \varphi_V^T + (1 - \iota_s) \varphi_V^T \rho_V \quad \forall s \end{aligned}$$

Trade creditors supply  $V$  for firms. Their outside option pays  $z$  for each unity of  $V$ . Since firms don't have any wealth to buy  $V$ , they offer assets to trade creditors paying 1 unit of output in all states of solvency, with residual claims if bankruptcy occurs.

Defining the equilibrium for this economy we have:

**Equilibrium:** An equilibrium for this economy is a list  $\langle \tau, q_V, q_K, (\theta_K^F, \theta_V^F, \varphi_K^B, \varphi_V^T) \rangle$

such that (1) to (7) hold:

- (1): for *Managers*,  $(\tau, \theta_K^F, \theta_V^F) \in \arg \max E[u(\tau, \theta_K^F, \theta_V^F)]$  over firm's budgeted  $B^F(q_K, q_V, K, V)$
- (2): for *Banks*,  $(\varphi_K^B) \in \arg \max E[b(\varphi_K^B)]$  over bank's budgeted  $B^B(q_K, \phi, K)$
- (3): for *Trade Creditors*,  $(\varphi_K^T) \in \arg \max E[TC(\varphi_K^B)]$  over trade creditor's budgeted  $B^T(q_V, z, V)$
- (4):  $(\theta_K^F - \varphi_K^B) = 0$
- (5):  $(\theta_V^F - \varphi_V^T) = 0$
- (6):  $K^F + K^B = \bar{K}$
- (7):  $V^F + V^T = \bar{V}$

Reorganization. Under a bankruptcy system that allows the reorganization procedure, in the financial distress states we have two possibilities of solution: liquidation if the firm is not economically efficient; and reorganization if it is economically efficient (see figure 2).

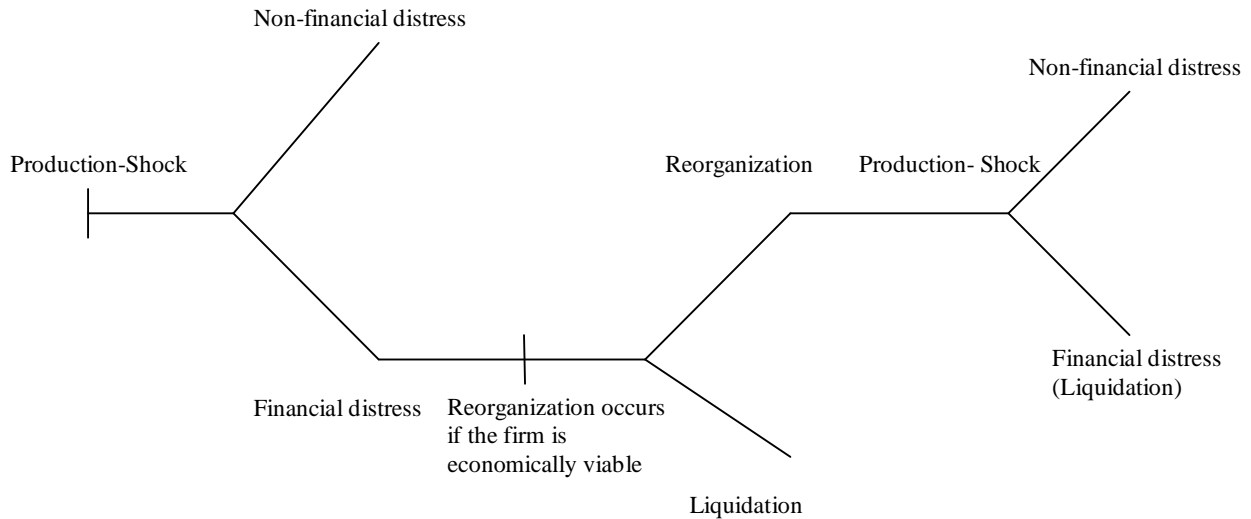


Figure 4.1. Figure 2: Scheme for Bankruptcy-reorganization

**Definition 2:** A financial distressed business is economically inefficient if the state of bankruptcy occurs and if its expected value doesn't exceed its liquidation value, i.e. if  $E_{s_1}[\eta_{s_1 s_2} f(K + (1 - \tau)K_0, V)] + p_{solv} \delta(K + (1 - \tau)K_0) + p_{ins} l \delta(K + (1 - \tau)K_0) \leq \eta_{s_1} f(K + (1 - \tau)K_0, V) + l(K + (1 - \tau)K_0)$ . Otherwise a financial distressed firm is economically efficient.

In words we can say that a *financial distressed* firm is economically inefficient if its liquidation value is bigger than its expected value if reorganization occurs.

Managers. Managers chose how much of fixed and variable input to buy and – if they own a positive amount of capital ( $K_0 > 0$ ) – how much of their capital to put in the firm (and, of course, how much to spend in risk-free assets with return of  $\phi$ ), looking to maximize their expected utility  $Eu(c)$ .

$$\max_{\tau, K, V, \theta_K^F, \theta_V^F} \sum_{s_1=1}^S p_{s_1} \left\{ u(c_{s_1}) + \beta \sum_{s_2=1}^S p_{s_2} [u(c_{s_1 s_2})] \right\}$$

s.t

$$c_{s_1} = \iota_{1s_1} (\tau K_0 \phi + \eta_{s_1} f(K + (1 - \tau)K_0, V) + (K + (1 - \tau)K_0) - \theta_K^F - \theta_V^F) +$$

$$(1 - \iota_{1s_1}) [(1 - \iota_{2s_1 s_2}) \cdot (\tau K_0 \phi + \eta_{s_1} f(K + (1 - \tau)K_0, V) + l(K + (1 - \tau)K_0) - \theta_K^F \rho_K^L - \theta_V^F \rho_V^L)]$$

$$c_{s_1 s_2} = (1 - \iota_{1s_1}) \iota_{2s_1 s_2} [\beta \sum_{s_2=1}^S p_{s_2} (\iota_{3s_1 s_2} (\tau K_0 \phi + \eta_{s_1 s_2} f(K + (1 - \tau)K_0, V) + \delta(K + (1 - \tau)K_0)$$

$$- \theta_K^F - \theta_V^F) (1 - \iota_{3s_1 s_2}) (\tau K_0 \phi + \eta_{s_1 s_2} f(K + (1 - \tau)K_0, V) + l\delta(K + (1 - \tau)K_0) - \theta_K^F \rho_K^R - \theta_V^F \rho_V^R)]$$

$$K = q_K \theta_K^F$$

$$V = q_V \theta_V^F,$$

where  $\iota_{1s_1} = 1$  when  $\eta_{s_1} f(K + (1 - \tau)K_0, V) + (K + (1 - \tau)K_0) - \theta_K^F - \theta_V^F \geq 0$  and 0 otherwise,  $\iota_{2s_1 s_2} = 1$  when  $\{E_{s_1}[\eta_{s_1 s_2} f(K + (1 - \tau)K_0, V)] - \eta_{s_1} f(\tilde{K} + (1 - \tilde{\tau})K_0, \tilde{V})\} + p_{sol} \delta(K + (1 - \tau)K_0) + p_{ins} l \delta(K + (1 - \tau)K_0) - l(\tilde{K} + (1 - \tilde{\tau})K_0) > 0$  and 0 otherwise, where  $K$  and  $\tilde{K}$  are fixed input and  $V$  and  $\tilde{V}$  are variable input if the firm chooses to reorganize or to liquidate, and  $\iota_{3s_1 s_2} = 1$  when  $\eta_{s_1 s_2} f(K + (1 - \tau)K_0, V) + \delta(K + (1 - \tau)K_0) - \theta_K^F - \theta_V^F \geq 0$  and 0 otherwise. The variables  $\rho^R$  and  $\rho^L$  represent the fraction received in bankruptcy after reorganization and in liquidation.

**Definition 3:** After the reorganization plan the state of liquidation is the state in which

$$\eta_{s_1 s_2} f(K + (1 - \tau)K_0, V) + \delta K - \theta_K^F - \theta_V^F < 0, \text{ and the state of recovery is the state}$$

$$\text{in which } \eta_{s_1 s_2} f(K + (1 - \tau)K_0, V) + \delta(K + (1 - \tau)K_0) - \theta_K^F - \theta_V^F \geq 0.$$

Banks. Since Banks are risk-neutral their objective function is:

$$\max_{\varphi_K^B} \phi(\bar{K} - q_k \varphi_K^B) + \sum_{s_1=1}^S p_{s_1} (\iota_{1s_1} \varphi_K^B + (1 - \iota_{1s_1}) (\iota_{2s_1 s_2} \sum_{s_2=1}^S p_{s_2} (\iota_{3s_1 s_2} \varphi_K^B + (1 - \iota_{3s_1 s_2}) \varphi_K^B \rho_K^R) + (1 - \iota_{2s_1 s_2}) \varphi_K^B \rho_K^L))$$

Banks supply  $K$  for firms. The return of the risk-free asset (outside option) pays  $\phi$  for each unity of  $K$ . Since firms don't have any wealth they offer assets to banks in exchange of  $K$ . The asset is a promise of payment of 1 unit of output in all states of solvency, with preferential claims if bankruptcy after reorganization occurs.

Trade Creditors. Trade creditors supply a specific good that serves as an input for firm's production.

$$\begin{aligned} \max_c u(c_0) + \beta \sum_{s_1=1}^S p_{s_1} \left( u(c_{s_1}) + \beta \sum_{s_2=1}^S p_{s_2} u(c_{s_1 s_2}) \right) \\ c_0 &= z(\bar{V} - q_V \varphi_V^T) \\ c_{s_1} &= \iota_{1s_1} \varphi_V^T + (1 - \iota_{1s_1})(1 - \iota_{2s_1 s_2}) \varphi_V^T \rho_V^L \quad \forall s_1 \\ c_{s_1 s_2} &= (1 - \iota_{1s_1}) \iota_{2s_1 s_2} (\iota_{3s_1 s_2} \varphi_V^T + (1 - \iota_{3s_1 s_2}) \varphi_V^T \rho_V^R) \quad \forall s_1, s_2 \end{aligned}$$

Trade creditors supply  $V$  for firms. Their outside option pays  $z$  for each unity of  $V$ . Since firms don't have any wealth to buy  $V$ , they offer assets to trade creditors paying 1 unit of output in all states of solvency, with residual claims if bankruptcy occurs.

Defining the equilibrium for this economy we have:

**Equilibrium:** An equilibrium for this economy is a list  $\langle q_V, q_K, (\theta_K^F, \theta_V^F, \varphi_K^B, \varphi_V^T) \rangle$  such

that (1) to (7) hold:

(1): for *Managers*,  $(\tau, \theta_K^F, \theta_V^F) \in \arg \max E[u(\tau, \theta_K^F, \theta_V^F)]$  over firm's budget  $B^F(q_K, q_V, K, V)$

(2): for *Banks*,  $(\varphi_K^B) \in \arg \max E[b(\varphi_K^B)]$  over bank's budget  $B^B(q_K, \phi, K)$

(3): for *Trade Creditors*,  $(\varphi_K^T) \in \arg \max E[T(\varphi_K^B)]$  over trade creditor's budget

$$B^T(q_V, z, V)$$

(4):  $(\theta_K^F - \varphi_K^B) = 0$

(5):  $(\theta_V^F - \varphi_V^T) = 0$

(6):  $K^F + K^B = \bar{K}$

$$(7): V^F + V^T = \bar{V}$$

#### 4.5. Simulation

In this section we simulate a two states of nature model (default and non-default) using:

- CRRA utility function to represent the managers' preferences:  $\frac{c^{1-\gamma}}{1-\gamma}$
- CES function to represent the firm's production function:  $[\alpha K^\rho + (1-\alpha)V^\rho]^{\frac{1}{\rho}}$
- CARA utility function to represent the trade creditors' preferences:  $-\exp(-rc)$
- and the following parameter values, most of them commonly used in growth models:<sup>18</sup>

$$\eta_D = 1, \eta_{ND} = 4, \eta_{DD} = 0.5, \eta_{DND} = 2, \beta = \frac{1}{1.25}, r = 1, \gamma = 2, \phi = 1.25, z = 1, \rho = -0.5^{19}, \delta = 0.84, p_S = 0.87 \text{ and } p_{NS} = 0.13^{20}.$$

Since the default probabilities were derived from 5-years maturity corporate bond, we consider that each period of this model last 5 years.

To analyze the effect of industry sectors and countries' characteristics on the choice of optimal bankruptcy law, we will vary the parameters  $\alpha$  and  $(1-l)$  in our simulations. The parameter  $\alpha$  determines the proportion of physical capital used in the sector, and  $(1-l)$  determines the cost of bankruptcy-liquidation normalized by the cost of bankruptcy-reorganization.

The diagram (Figure 3) describes the path of payoffs of a firm. In the first moment, the firm may have a positive shock (H), implying in a payoff of 4 or a negative shock that implies in a payoff of 1. If the firm is financially distressed it can be liquidated, selling all its assets or it can go to reorganization. If the reorganization is available, and if it is chosen, the firm has one more chance of a positive shock in the second moment.

<sup>18</sup>Each period of this model last 5 years

<sup>19</sup>See Koschel (2003). He found, for German data, that positive elasticities of substitution below unity are obtained for the majority of sectors and input pairs. This indicates an overall dominance of weak substitutability relationships. Our assumption is that elasticity substitution is 2/3, since  $\rho = \frac{\sigma-1}{\sigma}$ , where  $\sigma$  is the elasticity substitution parameter.

<sup>20</sup>Risk-adjusted default probabilities derived from corporate bond spreads. This probability of default is the mean of 5-year maturity bonds from AAA to B bonds. See Almeida and Philippon (2006).



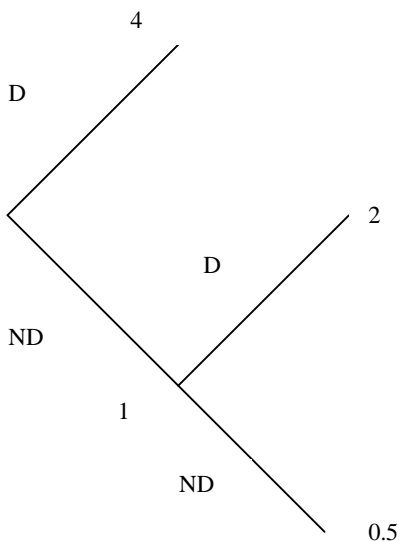


Figure 3: Payoffs' Diagram

#### 4.5.1. Simulation Results

The Figure 4 summarizes the general results of the simulation exercise. The axis y represents the proportion of physical capital used in the production function ( $\alpha$ ). The axis x refers to the cost of bankruptcy-liquidation normalized by the cost of bankruptcy-reorganization cost ( $1 - l$ ).

The basic results can be described as the following:

- For sectors intensive in physical capital the best procedure is pro-liquidation, since it permits secured creditors to recover their claims immediately, making the cost of capital lower. Looking vertically at the figure 4, we see that firms more intensive in capital have preference for the liquidation process. Intuitively, the higher cost of unsecured loans is more than compensated by the lower cost of unsecured loans, since the share of the later type of credit is higher.
- For sectors intensive in variable input the best procedure is pro-reorganization since it gives another chance to trade creditors recover their credit, making this cost lower and more than compensating the higher cost of the secured loans. Looking

vertically at figure 4, we see that firms less intensive in capital have preference for the reorganization process.

- The manager always put a higher share of her capital in the firm's production when the procedure is pro-reorganization.
- As the cost of bankruptcy-liquidation increases, the portion of capital that managers put in the firm increases. Intuitively, it happens due to the increase in the cost of secured credit, raising the marginal return for the managers' capital.
- In general, as the cost of bankruptcy-liquidation increases relative to the cost of bankruptcy-reorganization, the incentive to apply a pro-reorganization procedure increases. Notice that the area of pro-reorganization procedure tends to increase as the bankruptcy-liquidation increases.

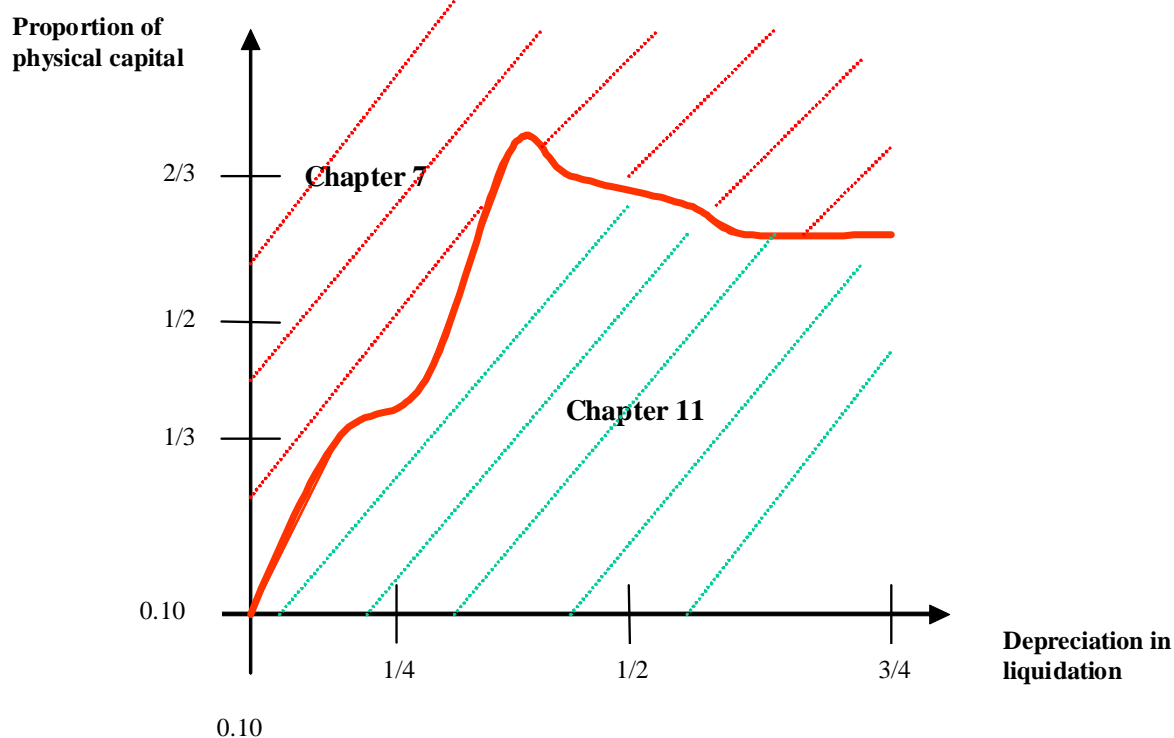


Figure 4: Optimal Bankruptcy Laws

### 4.5.2. The Optimal Bankruptcy Laws

Our strategy in this section is to compare our findings about the best bankruptcy procedure with the current procedures in 44 countries.

To do this, we impose two assumptions: first, we use the estimated value of the bankruptcy-liquidation cost for the U.S.;<sup>21</sup> second we use the U.S. sectorial costs share of materials and physical capital to calibrate the proportion of physical capital and variable input used in each one of the industry sectors. Using data from U.S. industry sector (that we interpret as industry representative) we hope to identify the technical component – common to the industry in every country – of industry physical capital intensity.

The information about the countries' industry sector is essentially from UNIDO Indstat-3 database, which provides a panel with data for 28 industries of several countries. The sectorial costs share of materials and physical capital of each industry is from the NBER-CES Manufacturing Industry Database. It is calculated as the mean for the 1990-1996 period. Since the definition of industry segments is different in NBER-CES Manufacturing Industry Database and UNIDO Indstat, the former classification is matched to the latter's 28 segments.

Once that the proportion of physical capital and the cost of bankruptcy-liquidation is known, it is possible to know the best bankruptcy procedure for each one of the 28 industry sectors.<sup>22</sup> To analyze the optimal bankruptcy law for each country we use the following method: first, we calculate the value added share of each industry sector for each country (to infer the size of each sector), then we sum the share of each sector that should have a pro-liquidation (or pro-reorganization) procedure. If the aggregated share of the pro-liquidation sectors is bigger than 50%, then the best for the country is a pro-liquidation bankruptcy

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<sup>21</sup>Bris et al. (2006) estimate that the average reorganization procedure retains value 137% better than the liquidation procedure in the U.S.. This result represents a cost of 0,58 for one unit of  $K$  in the liquidation procedure. The vector of cost in this case became (cost of reorganization, cost of liquidation)= (1, 0.42).

<sup>22</sup>See Table B at the Appendix B.

law, otherwise the best is a pro-reorganization bankruptcy law. The table 1 summarizes the results.<sup>23</sup>

As a result we see that 26 in a sample of 44 countries (or approximately 59%) apply a procedure totally aligned with our suggestions. We call pro-liquidation procedure the one that does not apply the automatic stay in the firms assets, otherwise we call it pro-reorganization. A second order feature is the restrictions imposed by the law on managers to enter in reorganization. Usually when there is no restriction the reorganization is reached more easily.

In the majority, countries that should have a pro-reorganization procedure does not apply the so-called automatic stay for the assets of the failed firm (12 cases). It brings a significant incentive to creditors take their collateral, usually assets that are important for the firms' life, eliminating any chance for the firm to reorganize. This generates a significant burden for trade creditors that takes it into account in their prices. For countries intensive in variable input, it is a negative feature of the bankruptcy law. On the other hand, four countries that should not have a pro-liquidation procedure does not apply it. These countries allows the automatic stay of the firms' assets and three of them does not impose any restrictions to managers on entering on reorganization procedure. Both features incentive the reorganization of the failed firms. Since the best for these countries is a pro-liquidation procedure, they should impose bot restrictions to enter in reorganization and no automatic stay.

Notice that the results suggest that approximately 80% of the countries (35 of 44) should apply a pro-reorganization bankruptcy law.

It is important to remember that this result depends on our hypotheses of bankruptcy costs, which we assume, for all countries, to be equal to the estimated level for the U.S.. For countries with a lower bankruptcy-liquidation costs the result should move forward to

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<sup>23</sup>The descriptions in red letters means that the share of sectors pro-liquidation (or pro-reorganization) is between 45% and 55%, wich means that the effect of both procedures on the economy is not too different.

the pro-liquidation procedure, while for countries with higher costs of liquidation the result should move forward to the pro-reorganization procedure.

Table 1: Bankruptcy Law Analysis

Countries	Optimal Bankruptcy	Current Bankruptcy Law	Proposed Changes
Australia	pro-reorganization	pro-liquidation	auto stay
Austria	pro-liquidation	pro-liquidation	none
Bangladesh	pro-reorganization	pro-reorganization	none
Belgium	pro-liquidation	pro-reorganization	no-auto stay and restrictions
Brazil	pro-liquidation	pro-reorganization	no-auto stay
Canada	pro-reorganization	pro-reorganization	none
Chile	pro-reorganization	pro-liquidation	auto stay
Colombia	pro-reorganization	pro-reorganization	none
Costa Rica	pro-reorganization	pro-reorganization	none
Denmark	pro-reorganization	pro-liquidation	auto stay
Egypt	pro-reorganization	pro-reorganization	none
Finland	pro-liquidation	pro-reorganization	no-auto stay and restrictions
France	pro-reorganization	pro-reorganization	none
Greece	pro-reorganization	pro-reorganization	none
India	pro-reorganization	pro-reorganization	none
Indonesia	pro-reorganization	pro-reorganization	none
Israel	pro-liquidation	pro-liquidation	restrictions on entering
Italy	pro-reorganization	pro-reorganization	none
Jamaica	pro-reorganization	pro-liquidation	auto stay
Japan	pro-reorganization	pro-reorganization	none
Jordan	pro-liquidation	pro-reorganization	no-auto stay and restrictions
Kenya	pro-reorganization	pro-liquidation	auto stay
Korea	pro-reorganization	pro-liquidation	none
Malaysia	pro-liquidation	pro-liquidation	none
Mexico	pro-reorganization	pro-reorganization	none
Morocco	pro-reorganization	pro-reorganization	none
Netherlands	pro-liquidation	pro-liquidation	none
New Zealand	pro-reorganization	pro-liquidation	auto stay
Nigeria	pro-reorganization	pro-liquidation	auto stay
Norway	pro-reorganization	pro-reorganization	none
Pakistan	pro-reorganization	pro-reorganization	none
Peru	pro-reorganization	pro-reorganization	none
Philippines	pro-reorganization	pro-reorganization	none
Portugal	pro-reorganization	pro-reorganization	none
Singapore	pro-liquidation	pro-liquidation	restrictions on entering
South Africa	pro-reorganization	pro-reorganization	none
Spain	pro-reorganization	pro-liquidation	auto stay
Silence	pro-reorganization	pro-reorganization	none
Sweden	pro-reorganization	pro-reorganization	none
Turkey	pro-reorganization	pro-liquidation	auto stay
UK	pro-reorganization	pro-liquidation	auto stay
US	pro-reorganization	pro-reorganization	none
Venezuela	pro-reorganization	pro-liquidation	auto stay
Zimbabwe	pro-reorganization	pro-liquidation	auto stay

#### 4.6. Conclusion

The main challenge of this paper was to explore – in a general equilibrium setting with incomplete markets and default – the best bankruptcy procedure considering an important aspect: the relationship between entrepreneurs who needs to raise funds and secured and trade creditors that provide the funds.

When lawmakers design a bankruptcy law that is best for their specific economy, they must capture the cross-country differences. Understanding these differences, we can search the optimal bankruptcy law for particular countries. Thus, we analyze how the optimal bankruptcy laws depend on the specific industries and countries characteristics, and propose the best law for different countries based on their particularities.

Considering two dimensions of heterogeneity – the physical capital intensity and the costs of bankruptcy – we reach, through simulation methods, the following results:

- For sectors intensive in physical capital the best procedure is pro-liquidation, since it permits secured creditors to recover their claims immediately, making the cost of capital lower,
- For sectors intensive in variable input the best procedure is pro-reorganization, since it gives another chance to trade creditors recover their credit,
- The manager always put a higher share of her capital in the firm's production when the procedure is pro-reorganization.
- As the cost of bankruptcy-liquidation increases, the portion of capital that managers put in the firm increases.
- In general, as the cost of bankruptcy-liquidation increases relative to the cost of bankruptcy-reorganization, the incentive to apply a pro-reorganization procedure increases.

After the simulation for a range of parameters, we fixed the bankruptcy-liquidation costs in the level estimated by the U.S. to find the best bankruptcy procedure for a sample of 44 countries. Our results points that approximately 59% of the countries in the sample apply a procedure totally aligned with our suggestions. Also, the results suggest that approximately 80% of the countries (35 of 44) should apply a pro-reorganization bankruptcy law.

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## 1. Appendix

Table B: Optimal Bankruptcy procedure by industry sector

Industry Setor	Optimal Bankruptcy Procedure
Beverages	pro-reorganization
Fabricated metal prod	pro-liquidation
Food products	pro-reorganization
Footwear	pro-reorganization
Furniture	pro-reorganization
Glass and others	pro-liquidation
Ind. Chemicals	pro-liquidation
Iron and Stell	pro-liquidation
Leather Prod	pro-reorganization
Machinery eletr.	pro-liquidation
Machinery except eletr.	pro-reorganization
Misc. Petr ans Coal	pro-reorganization
Non-ferrous	pro-reorganization
Other Chemical	pro-reorganization
Other manuf prod	pro-reorganization
Other non-metalic mineral prod	pro-liquidation
Paper	pro-liquidation
Petroleum Ref.	pro-reorganization
Plastic Products	pro-reorganization
Pottery China	pro-liquidation
Printing and publishing	pro-liquidation
Professional and scientific equip.	pro-liquidation
Rubber Products	pro-liquidation
Textiles	pro-reorganization
Tobacco	pro-liquidation
Transport Equipment	pro-reorganization
Wearing Apparel	pro-reorganization
Wood Products ex. forniture	pro-reorganization

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